



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.03.2023 Bulletin 2023/09

(51) International Patent Classification (IPC):
E04D 13/03^(2006.01) E04D 13/035^(2006.01)

(21) Application number: **21193907.9**

(52) Cooperative Patent Classification (CPC):
E04D 13/031; E04D 13/0354

(22) Date of filing: **31.08.2021**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **WIIG, Martin Schwartz**
Hørsholm (DK)
• **HANSESGAARD**
Hørsholm (DK)
• **SKJOLD JENSEN, Jimmy**
Hørsholm (DK)

(71) Applicant: **VKR Holding A/S**
2970 Hørsholm (DK)

(74) Representative: **Zacco Denmark A/S**
Arne Jacobsens Allé 15
2300 Copenhagen S (DK)

(54) **METHOD OF PROVIDING A ROOF WINDOW IN A ROOF STRUCTURE OF A BUILDING**

(57) The present disclosure relates to a method of providing a roof window (1) at a roof structure (100) of a building. The method comprises the steps of:

- providing a frame arrangement (10, 20) wherein said provided frame arrangement (10, 20) comprises a fixation frame (10) and a movable frame (20) for holding at least one insulated glass unit (2, 3), wherein the movable frame (20) is configured to be movably connected to the fixation frame (10) by means of a hinge arrangement (90) and wherein the movable frame (20) comprises structural elongated profiles comprising an elongated top profile (21a), an elongated bottom profile (21b) and parallel, elongated side profiles (21c, 21d),
- installing the frame arrangement (10, 20) in the roof structure (100),
- providing at least one insulated glass unit (2, 3) for installation in the movable frame (20), and arranging the at least one insulated glass unit (2, 3) in the movable frame (20) of the installed frame arrangement, and
- securing said at least one insulated glass unit (2, 3) to the movable frame (2) of the installed frame arrangement by means of a releasable, mechanical holding system (40, 50, 60).

The present disclosure moreover relates to a set of roof window components (2, 3, 10, 20).

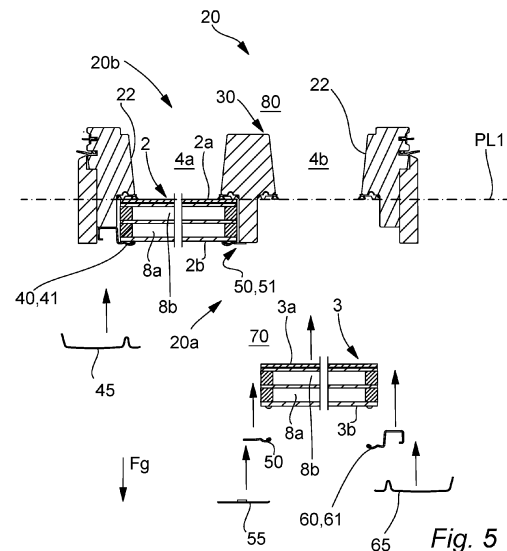


Fig. 5

Description

[0001] The present disclosure relates to a method of providing a roof window at a roof structure of a building, and a set of roof window components for a roof window for installation in a roof structure.

Background

[0002] Roof windows, also known as "skylights" are popular window solutions that provides desirable inflow of sunlight, and if it is the roof window types that may be opened and hence comprises a movable frame that is movably fixated to a fixation frame, it also provides advantageous ventilation options. Additionally, roof windows may enable providing sunlight to some parts of a building interior that may otherwise be left less illuminated and heated by sunlight.

[0003] Over the recent years, roof window designs have been improved in order to for example meet market demands and/or regulations relating to e.g. improved heat insulation performance, a safety impact test typically involving a 50kg impact, burglary resistance, increased daylight influx, ease of installation, more costs efficient solutions and/or the like.

This has resulted in roof windows that meets, or even outmatch, the market demands and/or regulations. The drawback of such roof windows may be a more complex roof window design and increased window weight. The working environment of a person installing the roof window may hence be challenged, also due to the elevated installation location of roof windows which may require relatively heavy lifts to elevated positions during roof window installation, and in some situations relatively heavy lifts to a level above shoulder level of an installation person. In some situations, this issue has been handled by assigning more installation personnel for installing a single roof window due to the weight and general construction of the roof window, so that the personnel together can lift the roof window. This may however still provide drawbacks with regard to working environments, and it may also result in a cost increase of the roof window installation.

[0004] Another solution is to provide a specialized lifting tool for use during roof window installation. Patent document EP3348513 A1 discloses such a solution. Such a tool may help to reduce working environment issues such as help to reduce the need of relatively heavy manual lifts to locations that may be especially wearing to the installation personnel, but a drawback is that the tool may still suffer from increased installation time and hence installation costs, for example as the tool needs to be properly arranged.

[0005] A still further solution comprises renting a vehicle with a crane and use this crane during roof window installation as e.g. disclosed in EP3192943 A1.

[0006] The present disclosure provides a solution where the above mentioned drawbacks are reduced, and hence where improved working environment may be obtained during roof window installation and which may facilitate a more cost efficient roof window installation and/or improve logistics.

Summary

[0007] The present disclosure relates to a method of providing a roof window at a roof structure of a building, wherein the method comprises the steps of:

- providing a frame arrangement wherein said provided frame arrangement comprises a fixation frame and a movable frame for holding at least one insulated glass unit, wherein the movable frame is configured to be movably connected to the fixation frame by means of a hinge arrangement and wherein the movable frame comprises structural elongated profiles comprising an elongated top profile, an elongated bottom profile and parallel, elongated side profiles,
- installing the frame arrangement in the roof structure,
- providing at least one insulated glass unit for installation in the movable frame, and arranging the at least one insulated glass unit in the movable frame of the installed frame arrangement, and
- securing said at least one insulated glass unit to the movable frame of the installed frame arrangement by means of a releasable, mechanical holding system.

[0008] This enables fast roof window installation where also improved working environment can be obtained. One person may provide substantially the entire installation process involving lifting of reduced weight.

[0009] Hence, an installation person may first install the frame arrangement in the roof structure. Subsequently, the installation person can then first install or at least fixate one or more insulated glass units in the movable frame. Thereafter, the person may install, or finalize installation of, the holding system so that the insulated glass unit(s) is/are maintained in the movable frame in a tight manner.

[0010] Larger sized roof windows may often have a total weight of above 34 kg (naturally dependent on size and type),

and the weight of the total insulated glass unit mass may here provide more than 40%, such as more than 50% of the total roof window weight.

[0011] In embodiments of the present disclosure, the roof window may have a U_{window} value that is less than 2 W/m²K, such as less than 1.5 W/m²K or less than 1.2 W/m²K

[0012] In one or more embodiments of the present disclosure, the roof window is configured to be installed in a roof having an inclination/roof pitch of above 8°, such as above 15°, such as above 25° when compared to horizontal. In one or more embodiments of the present disclosure, the roof window is configured to be installed in a roof having an inclination below 85°, such as below 75° when compared to horizontal.

[0013] In one or more embodiments of the present disclosure, the movable frame may be releasably connected to the fixation frame, preferably by means of a releasable hinge connection, so as to allow the movable frame to be movably connected to, and disconnected from, the fixation frame. Here releasable hinge connection may be understood as a two-piece hinge connection designed for fast connection and separation without any further disassembly required or without any removal of the fasteners. This improves working environment during window installation.

[0014] In one or more embodiments of the present disclosure, said step of installing the frame arrangement at/in the roof structure may comprise fixating the fixation frame to the roof structure, and subsequently attaching the movable frame to the fixated fixation frame by means of the hinge arrangement.

[0015] This divides the total frame weight in two, thereby helping to provide a less wearing installation for the installation person. It may also allow for a more easy fixation frame installation. And the missing weight from the insulated glass unit allows a more easy positioning and connection of the movable frame to the fixation frame.

[0016] After this the insulated glass unit(s) may be installed in the movable frame.

[0017] In one or more embodiments of the present disclosure, the movable frame comprises first hinge parts of the hinge arrangement, and the fixation frame comprises a second hinge parts of the hinge arrangement. These first and second parts movably engages when the movable frame is connected to the fixation frame, and the first hinge parts are configured to be detached from the second hinge parts so that the movable frame can be detached from the fixation frame.

[0018] In one or more embodiments of the present disclosure, the method may further comprise initially unpacking the roof window from a delivery packaging and disconnecting the movable frame from a fixation frame of the frame arrangement of the unpacked roof window prior to installing the a fixation frame at said roof structure.

[0019] In one or more embodiments of the present disclosure, said step of installing the frame arrangement in/at the roof structure may comprise installing the frame arrangement at the roof structure while the movable frame is connected to the fixation frame by means of the hinge arrangement.

[0020] As the insulated glass unit(s) is/are first installed after the frame arrangement is installed, the total frame weight of the frame arrangement may be easier to handle for the installation person and provide that the person does not need to install the movable frame after installing the fixation frame. Further the installation time may be reduced. And further damage and scratches to the visible part of the movable frame and the fixation frame can be reduced.

[0021] The glass unit(s), as disclosed in more details later on in this disclosure, stand for a substantial amount of the window weight, and by allowing the glass unit(s) to be installed after frame installation, this provides that the entire frame arrangement comprising the movable frame and fixation frame in some embodiments of the present disclosure may more easily be installed in one go.

[0022] In one or more embodiments of the present disclosure, the movable frame may comprises an exterior side for facing the exterior of the building when the movable frame is in a closed position, and an interior side for facing the interior of the building when the movable frame is in a closed position, wherein the hinge arrangement comprises a centre hinge arrangement allowing the movable frame to rotate at least 45°, such as at least 90°, such as at least 120° from the closed position to an open position.

[0023] This provides that at least a part of the exterior major surfaces of the insulated glass units that will normally face away from the interior of the building in which the window is installed, when the movable frame is in a closed position, can be reached from the inside of the building when installing the one or more insulated glass units in the movable frame. This may additionally allow to use stepped insulated glass units, where the exterior glass sheet is larger than the interior glass sheet, for example one or both sides can extend beyond the interior glass.

[0024] This may also provide an advantages with regard to providing a more simple movable frame and/or more simple and efficient water sealing solution between the movable frame and insulated glass units.

[0025] In one or more embodiments of the present disclosure, the fixation frame may substantially surround the movable frame.

[0026] Such a centre hinge arrangement may in some embodiments of the present disclosure be arranged so that a pivoting of the movable frame is provided when the movable frame is opened so that a top end part of the movable frame is configured to move inwards towards the building interior and a bottom end part of the sash/movable frame is configured to move outwards, when opening the sash from the closed position. Hereby, the installation person can more easily provide the window installation in a proper way.

[0027] In one or more embodiments of the present disclosure, said arranging of the at least one insulated glass unit

in the movable frame of the installed frame arrangement may be provided at least partly by an installation person from the interior of the building while the movable frame is in the open position and wherein said releasable, mechanical holding system is located at and accessible from an exterior side of the movable frame, where said exterior side is configured for facing the exterior of said building when the movable frame is in a closed position.

[0028] This helps to provide a fast and/or cost efficient roof window installation where heavy lifts may be reduced. Hence, a person may install the insulated glass unit(s) when installing the roof window, and this installation of the insulated glass unit may be provided after the frame arrangement has been fixed to a roof structure of the building by fixating the fixation frame to the building structure, and thereafter arranging the movable frame in the open position. Hence, weight issues during installation are reduced.

[0029] In one or more embodiments of the present disclosure, the insulated glass unit may comprise a peripheral enclosure comprising a securing arrangement, such as an angular part, extending from the insulated glass units and/or where the insulated glass units comprises a sealing arrangement. Providing the insulated glass unit with a peripheral enclosure may help to enable faster glass unit installation and/or replacement, and may also help to provide improved water tightness performance of the roof window. For example, the peripheral enclosure may comprise a moulded edge solution, such as for example a polymer edge solution, where this solutions fixates a fastening arrangement such as a fitting/mounting to the insulated glass unit. The fastening arrangement may provide be configured to be attached to the movable frame by means of mechanical fasteners such as screws, a releasable snap-fit assembly and/or the like. In some further embodiments, the moulded edge solution may comprise alignment recesses, such as slits, or protrusion that may be configured to engage with opposing protrusions or recesses of the movable frame, so as to improve glass unit alignment and hence correct installation of the respective insulated glass unit.

[0030] In one or more embodiments of the present disclosure, the step of securing the at least one insulated glass units to the movable frame by means of the releasable, mechanical holding system may comprise utilizing a secondary holding system, such as displaceable holding means, for temporarily retaining the at least one insulated glass unit at the frame opening, and subsequently securing the at least one insulated glass unit at the movable frame by means of further primary releasable, mechanical securing means for securing the at least one insulated glass unit to the movable frame.

[0031] The secondary holding means may be present on one such as two or more sides of the insulated glazing units. In one example the secondary holding means may comprise at least two or at least four displaceable holding means for the insulated glazing unit. Hereby an installer can hold the insulated glazing for example by hand or with a tool such as a suction cup tool while activating the displaceable holding means. It is preferred the secondary holding means such as displaceable holding means can be activated/operated automatically or by one hand only without any tools or fasteners. The displaceable holding means may e.g. comprise one or more of clamps, snap keeper, turn knobs, slider locks or similar known hardware. The displaceable holding means may be displaceable between two configurations, a first configuration where the insulated glass unit is released and a second configuration where the insulated glass unit is secured to the movable frame. The displaceable holding means can also cooperate with other holding elements. For example one side of the insulated glass unit may be held by a glass overlapping fitting (not shown) while the opposite side of the insulated glass unit is held by the displaceable holding means.

[0032] In one or more embodiments of the present disclosure, the holding system, such as the primary releasable, mechanical securing means, comprises re-usable mechanical glass overlapping securing means, such as a glazing bead arrangement. Re-usable mechanical glass overlapping securing means such as elongated glazing beads ensure proper uniform gasket pressure and water tightness while allowing to remove and reinstall the insulated glazing units. This may help installation personnel to provide a faster installation. Additionally or alternatively, it may help to assure that the correct, assigned securing means are used at the roof window which may beneficial in order to reduce the risk of installation errors.

[0033] In one or more embodiments of the present disclosure, the re-usable mechanical glass overlapping securing means may comprise one or more glazing beads with a plurality of screws and/or a releasable snap-fit assembly or glazing beads such as with extruded hinge assembly.

[0034] Insulated glazing units need to comply with impact requirements and transfer large forces so the displaceable holding means are a temporary aid during install of the insulated glazing unit and the major structural holding strength is provided by the primary securing means such as a glazing bead arrangement.

[0035] One or more gaskets such as rubber gaskets, elastomer gaskets and/or the like may be provided between a part of the movable frame and the insulated glass unit, and/or between a part of the insulated glass unit and a part of the holding system, so as to provide said water tightened connection between the movable frame and the insulated glass units.

[0036] In one or more embodiments of the present disclosure the insulating glass unit abutting seals and gaskets are releasable and thereby devoid of adhesive and sealant such as butyl. The seal and gaskets abutting the insulated glass unit are compression seals which use deformation to ensure tightness.

[0037] In one or more embodiments of the present disclosure, the method may further comprise, such as initially comprise:

- unpacking the roof window from a delivery package,
- loosening a releasable, mechanical holding system arranged to fixate one or more insulated glass units in the movable frame of the unpacked roof window, and
- removing the at least one insulated glass unit from the movable frame prior to installation of the frame arrangement.

[0038] In one or more embodiments of the present disclosure, said roof window may be arranged inside a common/joint delivery packaging, such as a cardboard packaging. After removing at least a part of the delivery packaging, a person may remove/disconnect the movable frame from the fixation frame, and additionally or alternatively remove one or (if more than one insulated glass unit is provided in the movable frame) a plurality of insulated glass units from the movable frame by releasing the releasable mechanical holding system. This enables that the user can divide the total weight of the roof window between several roof window sub parts which eases the installation of the roof window or at least subject the installation person to less weight and wear at a time during roof window installation. Further it can reduce the carry weight if the window parts are carried to the loft.

[0039] In one or more embodiments of the present disclosure, the method may further comprise unpacking the roof window from a delivery package and wherein the one or more insulated glass units are placed in said delivery package but substantially unattached, or only temporarily (and hence not fully installed at the movable frame as intended after roof window installation) attached to the movable frame. This may help to provide that a user does not need first to remove/disassemble the full a releasable, mechanical holding system but may instead more easily and faster make the window ready for installation according to the method of the present disclosure.

[0040] The insulated glass unit(s) may either be provided in the delivery package with for example a protective film or another packaging material such as cardboard or the like in a glass unit package solution that is separate in the delivery package (or frame package) in the sense that the glass unit(s) may be removed from that package while being in the protective packaging, or may even be separate there from at window delivery.

[0041] In one or more embodiments of the present disclosure, the at least one insulated glass unit may have/comprise a front side and a back side and where a side is marked, such as for wrong side install prevention, and/or where a shape prevents wrong side install.

[0042] Roof window insulated glass units should face the outside and inside correctly due to use of e.g. safety hardened glass, such as tempered glass and/or safety laminated glass and solar coatings and anti-dew coatings. When dealing with insulated glass units in a moving frame facing errors may easily be made. By marking the glass direction or adding a shape (such as protrusion or tongue) which cannot be mirrored a wrong install is mitigated.

[0043] In one or more embodiments of the present disclosure, said providing of the frame arrangement may comprises receiving a frame package at the site of the building comprising said roof structure, wherein the received frame package comprises at least the movable frame placed inside a protective frame packaging of the frame package. In further embodiments, said frame package may moreover comprises the fixation frame in said protective frame packaging. Additionally, said providing of at least one insulated glass unit for installation in the movable frame may comprise receiving at least one glass unit package at the site of the building comprising said roof structure, wherein the received at least one glass unit package comprises one or more insulated glass units for installation in said movable frame of the received frame package, and wherein said one or more insulated glass units is/are placed in a protective glass unit packaging of the at least one glass unit package, such as separate to the protective frame packaging.

[0044] The said frame package and said at least one glass unit package may in further embodiments of the present disclosure be configured to be individually portable prior to unpacking of their respective roof window content from the respective protective packaging of the frame package and the at least one glass unit package.

[0045] This may be advantageous in order to e.g. reducing the handling weight of the roof window and ease manual transport by hand. Additionally, it may help to enable faster window installation.

[0046] Installing the one or more glass units in the movable frame after the frame arrangement has been installed in the roof structure may also provide new delivery possibilities. This may provide one or more advantages relating to logistics and adaptability of the window to the respective building and client desires.

[0047] For example, the same frame arrangement of a specific size and type may be used for several different types and/or sizes of glass units, and by delivering the glass unit(s) in a separate package that is separate to the frame package, logistics may be improved and/or cost efficiency may be improved while allowing improved user adaptability and moreover, this may also be of an advantage to the installation person as that person may experience more easy and/or less wearing roof window installation.

[0048] The at least one glass unit package and the frame package may even in some embodiments be shipped from separate factories at different geographical locations and meet at a desired location determined by the entity or person ordering the specific glass unit and frame combination, or meet at the site of the building where it is to be installed.

[0049] It is understood that the movable frame and the fixation frame in some embodiments of the present disclosure may be delivered separated in each their individual frame package. In other embodiments, the movable frame and the fixation frame may be delivered in a common frame package, such as preassembled and attached to each other by means of the hinge arrangement in the common frame package.

[0050] In one or more embodiments of the present disclosure, the frame, such as the frame package, package and the at least one glass unit package may be delivered inside a common packaging, such as a common protective packaging, of a common roof window package at the building site, and wherein the common roof window package is unpacked so that said frame or frame package and/or said at least one glass unit package is/are exposed and individually portable prior to unpacking of the respective content from the respective protective packaging of the frame package and/or the at least one glass unit package.

This may e.g. be advantageous in order to assure that the right glass unit and frame arrangement is combined at the roof structure. This may additionally or alternatively have some logistic benefits and/or benefits with regard to improved protection prior to window installation at the building site.

[0051] In some embodiments, the one or more insulated glass unit packages may be placed inside the frame package so that the frame package acts as a common protective packaging for the frame (arrangement) and the insulated glass unit(s). Hence when opening the frame package, the frame arrangement may be exposed, but the insulated glass unit(s) may still be in the substantially intact protective glass unit packaging. In other embodiments, the common package may be a package that comprises packaging enclosing both the packaging of the frame package (with the frame arrangement therein) and the packaging of the at least one glass unit package (with the glass unit(s) therein) which may both be individually portable after opening of the common packaging.

[0052] In one or more embodiments of the present disclosure, the frame package and the at least one glass unit package may be delivered as loose individually portable packages at the building site. This may be advantageous, e.g. from a logistics and/or cost efficiency point of view. Additionally or alternatively, it may provide advantages with regard to manual portability as a person may more easily transport the roof window components by several lifts of lower loads per lift.

[0053] In one or more embodiments of the present disclosure, said protective packaging of one or more of said:

- frame package,
- said at least one glass unit package, and
- said common roof window package,

may comprises one or more of

- a protective cardboard sheet or box enclosing the respective package content,
- a plastic sheet material such as a plastic sheet enclosing, such as wrapped around, the respective package content,
- a shock absorbing material such as a foamed material, such as one or more of a polyurethane or polystyrene material located inside said respective package so as to increase mechanical protection of the package content.

[0054] In one or more embodiments of the present disclosure, the total weight of the roof window may be more than 35 kg such as more than 45 kg, for example more than 65 kg, wherein the total weight of the roof window comprises or consists of the total weight of said one or more glass units for installation in the movable frame, the weight of the movable frame and the weight of the fixation frame.

[0055] In one or more embodiments of the present disclosure, one or more elongated water covers may be attached to the movable frame, so as to extend over a part of the insulated glass units and so as to extend over a part of the movable frame, wherein the elongated water covers are arranged to cover said holding system and/or wherein said holding system comprises the elongated water covers.

[0056] Water tightening of roof windows may be a rather complex task as roof windows may be especially subjected to rain and also rainwater from the roof structure and issues with melting ice and snow.

Covering the holding system by means of water covers or assuring that the holding system comprises/provides the elongated water covers may be relevant to assure sufficient water tightening.

[0057] In one or more embodiments of the present disclosure, the total insulated glass unit weight/mass provided by one or more insulated glass units of the roof window is higher than the total weight of the fixation frame and the movable frame. Insulated glass units, especially modern insulated glass units of roof windows comprising at least three or at least four glass sheets in order to improve heat insulation performance and/or to improve safety (e.g. by means of a lamination glass solution) may be heavy.

[0058] The total insulated glass unit mass of the roof window may (in embodiments of the present disclosure) be above 17 kg, such as above 40kg, such as above 55 kg, for example between 17 kg and 75 kg, such as between 40 kg and 75 kg, such as between 55 kg and 75kg, or even more, dependent on the size and type of insulated glass unit(s) installed.

[0059] In one or more embodiments of the present disclosure, the total surface area of the insulated glass unit or units of the roof window described by exterior major surfaces of the insulated glass units configured to face away from the interior of the building when the movable frame is in a closed position is more than 0.6 m², such as more than 1 m².

[0060] In one or more embodiments of the present disclosure, the movable frame or a glass unit comprises a division bar arrangement wherein said division bar arrangement is configured so as to be arranged between and separate a first frame opening and a second frame opening of the movable frame.

[0061] In some embodiments said arranging of the at least one insulated glass unit in the movable frame may comprise that separate individual insulated glass units are installed at said first and second frame openings.

[0062] By providing multiple insulated glass units in a roof window according to the present disclosure, the glass unit weight is divided between individually installable insulated glass units which may help to enable more cost efficient installation and/or improved working environment during roof window installation.

[0063] In one or more embodiments of the present disclosure, the roof window may comprise at least two insulated glass units, such as at least three or at least four insulated glass units arranged in the common glass unit plane, and each of these openings may be separated from the adjacent frame opening by a division bar arrangement.

[0064] In other embodiments of the present disclosure, a single full size insulated glass unit may be installed so as to cover the entire frame opening of the movable frame, and the division bar may be omitted. Still this may advantageously distribute the handling weight during roof window installation.

[0065] In some embodiments of the present disclosure, the insulated glass unit(s) may (each, if more than one glass unit is to be installed at the movable frame) comprise at least three glass sheets, preferably at least four glass sheets. This may provide insulated glass units with improved heat insulation performance and/or improved safety, e.g. in case the insulated glass units comprises a lamination glass solution.

[0066] In one or more embodiments of the present disclosure, the insulated glass unit(s) comprises two or more insulating gaps separated by an intermediate glass sheet.

[0067] In one or more embodiments of the present disclosure, the insulated glass unit(s) each comprises a lamination glass attached to another glass sheet of the insulated glass unit by means of an interlayer/lamination layer.

[0068] The present disclosure additionally relates, in a second aspect, to a set of roof window components for a roof window for installation in a roof structure, said set comprising:

- a frame package comprising at least a movable frame placed inside a protective frame packaging of the frame package, such as wherein said frame package moreover comprises a fixation frame in said protective frame packaging, and
- at least one glass unit package comprising one or more insulated glass units for installation in said movable frame of the frame package, wherein said one or more insulated glass units is/are placed in a protective glass unit packaging of the at least one glass unit package separate to the protective frame packaging.

[0069] Such a set may help to provide improved installation options of the installation person using the set, and/or provide advantages with regard to logistics and/or cost efficiency.

[0070] In some further embodiments of the present disclosure according to the second aspect, said frame package and said at least one glass unit package may be configured to be individually portable prior to unpacking of their respective roof window content from the respective protective packaging. In other embodiments, the frame package may e.g. contain the glass unit package(s) inside, so when opening the frame package, thereby preferably exposing the frame (arrangement), the glass unit package may also be exposed but in a still unpacked condition.

[0071] In one or more embodiments of the second aspect, the frame package and the at least one glass unit package may be placed inside a protective packaging of a common roof window package, and wherein the common roof window package is configured to be unpacked so that said frame package and said at least one glass unit package are exposed and individually portable prior to unpacking of their respective content from the respective protective packaging.

[0072] Additionally, the present disclosure in a third aspect relates to use of the content of packages of the set according to any of claims 14 or 15 for installation of a roof window in a roof structure of a building with a roof pitch larger than 8° such as larger than 15°, wherein said installation of the roof window is provided by means of a method of any of claims 1-14.

Figures

[0073] Aspects of the present disclosure will be described in the following with reference to the figures in which:

fig. 1 : illustrates a roof window according to embodiments of the present disclosure installed in a roof structure,

fig. 2 : illustrates a pivot roof window comprising a division bar arrangement according to embodiments of the present disclosure,

- fig. 3 : illustrates a roof window comprising a division bar arrangement according to embodiments of the present disclosure,
- fig. 4 : illustrates an installation method according to embodiments of the present disclosure,
- fig. 5 : illustrates an installation method according to embodiments of the present disclosure where the roof window is a pivot window/center hung window and where a movable frame has been rotated so that an exterior side faces inwards,
- fig. 6 : illustrates a roof window comprising interior, releasable securing means according to embodiments of the present disclosure,
- figs. 6-9b : illustrates different embodiments of the present disclosure where secondary holding means are provided,
- figs. 10-11 : illustrates different embodiments of the present disclosure where a shape help to prevent wrong side installation of an insulated glass unit, according to embodiments of the present disclosure,
- fig. 12 : Illustrates an insulated glass unit comprising an peripheral enclosure arrangement, for installation in a movable frame, according to embodiments of the present disclosure,
- fig. 13 : Illustrates an embodiments of the present disclosure where a marking is provided to prevent/avoid wrong side installation of an insulated glass unit,
- figs. 14-15b : illustrates roof windows according to further embodiments of the present disclosure, comprising different division bar arrangement solutions,
- fig. 16 : illustrates an embodiment of the present disclosure wherein division bar arrangement is attached to an insulated glass unit prior to installation of the glass unit in the movable frame,
- figs. 17-18 : illustrates a pivot roof window where a division bar arrangement is omitted and a "full size" insulated glass unit is provided in a movable frame, according to embodiments of the present disclosure, and
- figs. 19a-19d : illustrates various packaging solutions according to various embodiments of the present disclosure

Detailed description

[0074] Fig. 1 illustrates schematically illustrates a roof window 1 according to embodiments of the present disclosure, seen from the exterior of the building and towards the roof. The roof window 1 is installed in a roof structure 100 and is hence directly or indirectly attached to the roof structure so as to cover a building aperture in the roof. A roofing 101 such as e.g. roof tiles, roofing felt, thatching or the like covers a carrying roof structure (not illustrated). A fixation frame (not illustrated in fig. 1) of the roof window 1 may e.g. be directly or indirectly fixated to the carrying roof structure.

[0075] The roofing of the roof structure of the building comprising the roof structure may in embodiments of the present disclosure be arranged/designed to have a roof pitch of above 8°, such as above 15°, such as above 25° when compared to horizontal.

[0076] The roofing of the roof structure of the building comprising the roof structure may in embodiments of the present disclosure be arranged/designed to have a roof pitch below 85°, such as below 75° when compared to horizontal.

[0077] Such roofing pitch usually requires the installer to carry the window through the building up to the loft and install the window from the inside.

[0078] The roof window 1 comprises a first insulated glass unit 2 and a second insulated glass unit 3 arranged side by side. The roof window moreover comprises at least one division bar arrangement 30 that is arranged between and separates a first frame opening 4a and a second frame opening 4b of a movable frame of the roof window. The first insulated glass unit 2 is arranged to cover the first frame opening, and the second insulated glass unit 3 is arranged to cover the second frame opening 4b. As can be seen from fig. 1, the insulated glass units 2, 3 may in some embodiments of the present disclosure be arranged side by side and extend in the height direction of the movable frame by at least 70%, such as at least 80%, such as at least 90% of the entire height of the movable frame 20, hence, often resulting in an elongated shape of the insulated glass units 2, 3. Here, the insulated glass units may hence extend between the top and bottom profiles 21a, 21b.

[0079] In embodiments of the present disclosure, the roof window may be a roof window comprising a centre hung movable frame/sash. Figs. 1 and 2 illustrates an embodiment of such a centre hung roof window, also known as a pivot roof window.

[0080] As can be seen, the window 1, and hence the movable frame of the window (described in more details below) has a height direction HD and a width direction WD.

[0081] Fig. 2 illustrates schematically and in perspective a centre hung roof window according to embodiments of the present disclosure, where the movable frame 20 is connected movably, such as pivotably, to the fixation frame 10 of the roof window by means of a hinge arrangement 90.

[0082] Such centre hung roof windows provides an axis of rotation RAX placed between the top and bottom of the window. Often the axis of rotation RAX is substantially about the centre part of the side elongated side frame arrangements of the fixation frame 10 and the side elongated side frame arrangements/profiles 21c, 21d of the movable frame. But sometimes the axis of rotation RAX can for example be raised such as 1/3 of the total window height, and it is understood that this may also provide a centre hung roof window/pivot window as understood in the present disclosure. The hinge arrangement 90 may be arranged so that the top end part 5a of the movable frame/sash 20 is configured to move inwards and a bottom end part 5b of the movable frame 20 is configured to move outwards when opening the movable frame from a closed position. The advantages, however, may remain the same: for example, a pivot/centre hung roof window allows rotation of the movable frame so the exterior may be cleaned from the inside. The weather proofing and water drain must be carefully designed for such pivoting roof windows.

[0083] It is generally understood that the fixation frame may comprise elongated profiles comprising parallel side profiles 11c, 11d, and a top profile 11a that is substantially parallel to a bottom profile of the fixation frame. Hence, these profiles 11a-11d may provide a rectangular shaped profile providing a fixation frame opening that is configured to be covered by the movable frame 20 when the movable frame 20 is in the closed position.

[0084] In one or more embodiments of the present disclosure, the hinge arrangement 90 may be configured so that the movable frame 20 is configured to rotate at least 90°, such as at least 120° around the rotation axis RAX from the closed position to an open position.

[0085] In some embodiments, the movable frame 20 may be rotatably arranged and connected to the fixation frame 10 by means of the hinge arrangement 90 so that the exterior side 20a of the movable frame that normally faces away from the building interior 70 and towards the building exterior 80 when the movable frame 20 is closed, may face towards the interior of the building when the movable frame is rotated around the axis RAX to its other extreme open position where the movable frame may be rotated no further from the closed position. It is to be understood that the movable frame 20 may be placed in various positions between the closed movable frame position and the other extreme open movable frame position.

[0086] The hinge arrangement 90 may generally comprise a releasable hinge connection understood as a two-piece hinge connection designed for fast connection and separation without any further disassembly required or without any removal of the fasteners. Such kind of hinges may often be used in modern roof windows and are e.g. disclosed in EP3252255B1 and EP1038083B1. The hinges stand out, e.g. because their two pieces automatically engage and lock to each other in a safe manner when the fixation frame 10 piece and movable frame 20 piece are connected during installation, so the movable frame 20 and the fixation frame 10 are assembled.

[0087] In one or more embodiments of the present disclosure, the releasable hinge connection may be or comprise a central pivot releasable hinge connection where a pivoting opening can be realized with the movable frame 20 rotating at a substantially central portion of the window sides 11c, 11d (see e.g. fig. 2).

[0088] The bottom end part 5b of the movable frame 20 comprises an elongated, structural elongated bottom profile 21b having an inner surface facing towards the top end part of the sash, and an opposite exterior surface facing away from the top end part. The top end part 5a of the movable frame 20 comprises an elongated, structural top profile 21a having an inner surface facing towards the bottom end part of the sash, and an opposite exterior surface facing away from the bottom end part.

[0089] The movable frame additionally comprises structural elongated side profiles 21c, 21d. The side profiles 21c, 21d may be arranged parallel, and the top and bottom profiles 21a, 21b are substantially parallel. The top and bottom profiles 21a, 21b extends substantially perpendicular to the longitudinal directions of the side profiles 21c, 21d, and hence, the periphery of the movable frame 20 has a rectangular, peripheral shape which encloses the first frame opening 4a and a second frame opening 4b of a movable frame 20.

[0090] As mentioned above, the movable frame 20 comprises a division bar arrangement 30 that is arranged between and separates the first frame opening 4a and the second frame opening 4b of the movable frame 20. It may also be understood that the division bar arrangement 30 divides a large movable frame opening defined by the profiles 21a-21d into two sub-frame openings, i.e. the first and second frame openings 4a, 4b.

[0091] As described in relation to (and/or illustrated in) for example figs. 17 and 18, the division bar arrangement may also in other embodiments of the present disclosure be omitted and a single larger "full size" insulated glass unit may be provided, or the division bar arrangement may be provided in a solution together with a "full size" single insulated

glass unit for installation in the movable frame 20 that extends transverse over and overlaps the sides of the division bar arrangement.

[0092] In the examples of figs. 1 and 2, the division bar arrangement 30 extends between and interconnects the top and bottom profiles 21a, 21b, and may be substantially parallel to the structural side profiles 21c, 21d of the movable frame. The division bar arrangement 30 may also be referred to as a "mullion" or "mullion bar".

[0093] In one or more embodiments of the present disclosure, the total weight of the roof window is more than 35 kg, such as more than 45 kg, for example more than 65 kg.

[0094] The total insulated glass unit 2, 3 mass of the roof window may in embodiments of the present disclosure be above 17 kg, such as above 40kg, such as above 55 kg. For example, in some embodiments of the present disclosure, For example, the total insulated glass unit 2,3 mass of the roof window may In embodiments of the present disclosure be between 17 kg and 75 kg, such as between 40 kg and 75 kg, such as between 55 kg and 75kg, or even more, dependent on the size and type of insulated glass units installed.

[0095] Fig. 3 illustrates schematically a cross sectional view of a roof window 1 comprising the division bar arrangement 30 according to embodiments of the present disclosure.

[0096] In the figures of the present disclosure illustrating a cross section of the roof window 1 according to embodiments of the present disclosure, the insulated glass units are illustrated with cut-through indicating that the figures does not illustrate the full width of the insulated glass units 2, 3, in order to improve understanding of the figures and avoid the frame arrangement to get too small for the figures.

[0097] The insulated glass units 2, 3 each comprises multiple glass sheets 6a-6d, and at least one insulated gap 8a, 8b between two opposing glass sheets. In embodiments of the present disclosure, the insulated glass units 2, 3 comprises at least two glass sheets such as at least 3 glass sheets, such as at least 4 glass sheets 6a-6d. In the example of fig. 3, the insulated glass units 2, 3 each comprises four glass sheets 6a-6d.

[0098] The glass sheets 6a-6d are placed so that an intermediate glass sheet 6b is placed between two other glass sheets 6a, 6c, thereby providing two insulated gaps 8a, 8b. one or both of the gaps 8a, 8b may be filled with a gas such as an inert gas, such as argon. In other embodiments of the present disclosure one or both of the gaps 8a, 8b may be evacuated, thereby providing an insulated glass unit. In that case, support structures such as a plurality of pillars may be arranged in the evacuated gap to maintain the distance between the glass sheets enclosing the gap.

[0099] Generally, the gaps 8a, 8b are also sealed at the edge of the insulated glass unit by means of an edge seal 9. Such an edge seal 9 may comprise various components and/or materials dependent on the type of insulated glass unit 2, 3 in order to provide different functionalities such as one or more of heat insulation, moisture absorption, glass sheet 6a-6c spacing and/or the like.

[0100] It is understood that more or less glass sheets may be provided in order to provide that the insulated glass unit comprises at least one gap, such as at least two gaps, such as at least three or four gaps separated by glass sheets of the insulated glass unit 2,3.

[0101] The insulated glass units 2, 3 may be of substantially the same physical size and/or weight. Smaller roof windows may often have a total weight of above 34 kg (naturally dependent on size and type), and the weight of the total insulated glass unit mass may here provide more than 40%, such as more than 50% of the total roof window weight.

[0102] In embodiments of the present disclosure, the total surface area of the insulated glass units 2, 3 of the roof window 1 described by outer major surfaces 2b, 3b of the insulated glass units configured to face away from the interior of the building when the movable frame is in a closed position may be more than 0.6 m^2 , such as more than 0.8 m^2 , such as more than 1 m^2 , such as more than 1.5 m^2 .

[0103] In one or more embodiments of the present disclosure, the roof window may have a size of at least 0.92 m^2 , such as at least 1.4 m^2 , such as at least 2 m^2 (described by the outermost side and top surfaces of the roof window.)

[0104] In embodiments of the present disclosure, the individual weight of each of the insulated glass units 2, 3 may be less than the total weight of the fixation frame 30 and the movable frame 20.

[0105] In fig. 3, the insulated glass units 2, 3 are laminated insulated glass units, such units may comprise a further glass sheet 6d, e.g. called a lamination glass that is attached to the glass sheet 6c by means of an interlayer/lamination layer 7 such as a PVB (polyvinyl butyral) layer or EVA (Ethylene Vinyl Acetate) layer.

The lamination glass 6d faces the interior of the building as a safety measure.

[0106] In embodiments of the present disclosure, the frame arrangement design and insulated glass unit design may together provide that the roof window may have a U value, also called a " U_{window} " value that is less than $2 \text{ W/m}^2\text{K}$, such as less than $1.5 \text{ W/m}^2\text{K}$ or less than $1.2 \text{ W/m}^2\text{K}$.

[0107] Table 1 below provides examples of different roof windows 1 where the (round off) weight of a frame arrangement of various types and sizes, the weight of insulated glass units (IGU) of various types and sizes, and the total window weight of various window types and sizes, are exemplified. This is provided for two roof window sizes comprising a "regular" roof window size (78 cm x 118 cm providing a total surface area defined by the fixed frame of about 0.92 m^2), and a "large" roof window size (134 cm x 160 cm providing a total surface area defined by the fixed frame of about 2.14 m^2) respectively. It is noted that the weight of the insulated glass units in Table 1 relates to the total insulated glass unit

mass, and hence, in accordance with embodiments of the present disclosure, this weight may substantially be divided between the first and second insulated glass units 2, 3, or even more insulated glass units if present, according to embodiments of the present disclosure.

Table 1

Regular window 78x118cm (0,92m ²)		Approximate weight (kg)
	Frame arrangement of polymer material	19
	Frame arrangement of wood material (at least solid wood material core)	18
	2 layer IGU (3+3lami 4mm)	17
	3 layer IGU (3+3lami 3mm 4mm)	22
	Total polymer frame with 2 layer IGU	36
	Total polymer frame with 3 layer IGU	41
	Total wood frame with 2 layer IGU	35
	Total wood frame with 3 layer IGU	40
Large window 134x160cm (2,14m ²)		Approximate weight (kg)
	Frame arrangement of polymer material	33
	Frame arrangement of wood material (at least solid wood material core)	27
	2 layer IGU (3+3lami 4mm)	44
	3 layer IGU (3+3lami 3mm 4mm)	58
	Total polymer frame with 2 layer IGU	77
	Total polymer frame with 3 layer IGU	91
	Total wood frame with 2 layer IGU	71
	Total wood frame with 3 layer IGU	85

[0108] For example, a "3+3lami 3mm 4mm" IGU 2,3 comprises the following glass sheets:

- Outer Glass sheet 6a comprising exterior surface 2b or 3b: 4 mm thick glass sheet, such as a 4 mm tempered, such as thermally tempered glass sheet, for improved strength
- Intermediate glass sheet 6b: 3 mm annealed or tempered glass sheet
- Glass sheet 6c: 3 mm annealed or tempered glass sheet
- Lamination glass sheet 6d comprising exterior surface 2a or 3a: 3 mm thick annealed or tempered glass sheet.

[0109] A "3+3lami 4mm" IGU comprises a single insulating cavity 8a, and hence comprises the following glass sheets:

- Outer Glass sheet 6a comprising exterior surface 2b or 3b: 4 mm thick glass sheet, such as a 4 mm thick glass sheet, such as tempered, such as thermally tempered glass sheet for improved strength
- Glass sheet 6c: 3 mm thick annealed or tempered glass sheet
- Lamination glass sheet 6d comprising exterior surface 2a or 3a: 3 mm thick annealed or tempered glass sheet.

[0110] The weight of the frame arrangement specifies the combined weight of the fixation frame 10 and the movable frame 20. Generally each frame part (fixation frame and movable frame) may have a weight about 50% each, or the combined weight of the fixation frame 10 and the movable frame 20 may be distributed with a weight distribution of 40-60% for one of the fixation frame and movable frame, where the other of the weight of the fixation frame and movable

frame provides the remaining weight up to 100% of the frame arrangement.

[0111] In fig. 3, the movable frame 20 is arranged in a closed position, and hence, in this position, tightening arrangements 12 such as resilient gaskets, for example rubber gaskets assure tightness between the movable frame 20 and fixed frame 10.

[0112] The movable frame also comprises a water tightening arrangement 13 comprising a gasket or the like, e.g. a rubber gasket or an elastomer gasket, a butyl gasket solution or the like for improving water tightness at the exterior side 20a of the movable frame 20.

[0113] The insulated glass units 2, 3 are secured to the movable frame 20 by means of a holding system such as a releasable, mechanical holding system 40, 50, 60

[0114] The insulated glass units 2, 3 may as illustrated, in embodiments of the present disclosure, be secured to the movable frame by means of mechanical securing means 41, 51, 61, such as a clamping arrangement, of the holding system 40, 50, 60. In some embodiments, the mechanical securing means may be re-useable and hence be disconnected from the movable frame and reconnected to the movable frame 20 by means of mechanical fastening arrangement (not illustrated) such as comprising one or more of a clamping system, a plurality of screws and/or a releasable snap-fit assembly.

[0115] The mechanical securing means 41, 51, 61 are in fig. 3 arranged at the side 20a of the movable frame configured to face the exterior 80 of the building when the movable frame 20 is in a closed position.

[0116] The water tightening arrangement 13 may be arranged between, such as clamped between, the mechanical securing means 41, 51, 61 and the insulated glass unit 2, 3 so as to provide sufficient water tightness.

[0117] The mechanical securing means 41, 51, 61 may in embodiments of the present disclosure be or comprise re-useable mechanical glass overlapping securing means such as a glazing beads.

[0118] One or more elongated water covers 45, 55, 65 (see also figures described further below) may in embodiments of the present disclosure be attached to the movable frame 20. In the example of fig. 3, the water cover 55 is placed to cover a part of the division bar arrangement 30, and is fixated directly or indirectly to the division bar arrangement 30 by means of fastening means 55a for fastening the water cover. Hence, after the mechanical securing means 41, 51, 61 are installed and secures the insulated glass unit 2, 3, the water cover(s) may be placed to provide improved water tightness by guiding water such as rain water and melting water to the exterior major surface of the insulated glass unit. Hence, the elongated water cover 5 comprises side one or more parts that extend over a part of the insulated glass unit 2, 3 and another part that overlap a part of the movable frame. Hence water may be guided either towards the insulated glass unit or towards the roof dependent on where the water cover is placed at the roof window.

[0119] It is generally understood that the elongated water covers 45, 55, 65 may be considered parts that are separate to the mechanical holding system 40, 50, 60 such as separate to the mechanical securing means 41, 51, 61. In such a case, the elongated water covers 45, 55, 65 may be arranged to cover the mechanical holding system 40, 50, 60 such as the mechanical securing means 41, 51, 61.

[0120] In other embodiments of the present disclosure, the holding system 40, 50, 60 may comprise the elongated water covers. For example, in some embodiments of the present disclosure (not illustrated), the elongated water covers 45, 55, 65, such as the one(s) arranged at the division bar arrangement 30, may be integrated in the mechanical securing means 41, 51, 61. For example, if the mechanical securing means 51 comprises a mechanical elongated clamping profile extending parallel to the division bar arrangement 30, this may also provide the water cover 55.

[0121] The water cover designs at the division bar arrangement 30 and at the location of the side profiles 21c, 21d respectively may vary. This may for example be the case if the movable frame 20 is a centre hung frame/pivot frame as the water covers may here need to be divided into separate parts where one water cover, such as lower water covers (see refs 45 and 65 in fig. 2), are fixed to the movable frame 20, e.g. at the side profiles 21c, 21d and other upper water covers (45b, 65b at fig. 2) are fixed to e.g. side profiles of the fixation frame 10. When the movable frame 20 is in the closed position, the lower and upper water covers at the window sides may be arranged in continuation of each other. When the movable frame is opened, this provides a reduced angle between the lower and upper water covers at the roof window sides when compared to the angle at when the movable frame is in the closed position. This solution may not need to be the provided for the water cover at the division bar arrangement 30 as this water cover e.g. may comprise an elongated, such as single piece, water cover profile that extends from the bottom profile 21b and substantially all the way to the top profile 21a, dependent on the division bar design.

[0122] The fixation frame 10 may also comprise a top water cover 14 that extends in over and covers the upper part of the movable frame 20, such as extend in over and cover at least a part of the top profile 21a, when the movable frame 20 is in a closed position. This top water cover 14 may extend along the longitudinal direction of an upper fixation frame profile 11a.

[0123] The division bar arrangement 30 and the side profiles 21c, 21d (and possibly also the top and/or bottom profiles 21a, 21b) of the movable frame 20 comprises glass unit supporting part 44, 34, 54 that comprises support surfaces supporting the insulated glass units 2,3 at/near the edges of the insulated glass units 2, 3, preferably by the outer surfaces 2a, 3a resting directly or indirectly on the glass unit supporting part 44, 34, 54.

[0124] The division bar arrangement 30 comprises an elongated profile that comprises a lower glass unit supporting part 34 that comprises support surfaces 31 which faces the outer surface 2a, 3a of the respective insulated glass unit 2, 3 that faces towards the interior 70 of the building when the movable frame 20 is closed. A resilient tightening 32, such as a resilient gasket such as a rubber gasket, a butyl material or the like is arranged between the glass unit surface 2a, 3a and the surface 31 of the lower glass unit supporting part 34.

[0125] In the example of fig. 3, the insulated glass units 2,3 are at the edges clamped between the surfaces 31 and the securing means 51 such as securing means comprising one or more removable clamps, where the surfaces 31 may act as counter hold. This clamping may deform one or both of the tightening 32, 13, hence providing an improved water and/or air tightening between the supporting division bar part 30 and the insulated glass units 2,3.

[0126] As can be seen the division bar arrangement 30 may comprise a division part 30b that extends between the opposing, parallel edges 2c, 3c of the insulated glass units 2, 3 and is integrated in or fixed to the supporting part 34. This division part 30b may in some embodiments of the present disclosure help to provide improved heat insulation performance.

[0127] The division part 30b may additionally or alternatively act as a connection interface for the holding system 50, for example, the mechanical securing means 51, such as comprising one or more claps, may be detachably fixated to the division part 30b.

[0128] It is generally understood that one or more of the profiles 21a-21d and/or the profile of the division bar arrangement 30, such as a profile comprising the lower glass unit supporting part 34, may be substantially solid and e.g. comprise a wooden/wood material core. However, in other embodiments of the present disclosure, one or more of the profiles 21a-21d and/or the profile of the division bar arrangement 30, and in some embodiments also the profiles 11a-11d of the fixation frame may be hollow. Here, the frame profile interior may comprise heat insulation material such as a polymer material, such as a foamed polymer, such as a Polyurethane insulation or the like. Additionally or alternatively, the heat insulation material in the profile interior may comprise mineral wool, glass wool, a natural fibre insulation material and/or the like. In some embodiments, the profiles 21a-21d, and/or the profile of the division bar arrangement 30 may comprise an air filled interior comprising one or a plurality of division walls placed in the profile interior. The profiles may e.g. be made by means of extrusion, pultrusion and/or any other suitable type profile manufacturing type such as e.g. a moulding solution. Metal reinforcements may be placed in these profiles in some embodiments of the present disclosure. Also, the division part 30b may in some embodiments of the present disclosure be hollow as mentioned above and comprise heat insulating air filled cavities divided by partition walls and/or cavities filled with a heat insulation material as e.g. mentioned above.

[0129] As can be seen, the division bar arrangement 30 comprises outer side surfaces 33a, 33b facing towards each their frame opening 4a, 4b of the movable frame. These surfaces may face towards and be placed opposite to the outer surfaces 22 of the respective side profiles 21c, 21d of the movable frame 20 that faces the same respective frame opening 4a, 4b.

[0130] The insulated glass units 2, 3 are placed in the common glass unit plane PL1. This plane PL1 may be defined by the interior surfaces 2a, 3a, or exterior surfaces 2b, 3b of the insulated glass units. In the example of fig. 3, the interior surfaces, 2a, 3a defines/is comprised in the common glass unit plane PL1.

[0131] The glass units 2, 3 may as also mentioned above be of the same physical size and comprise the same number of glass sheets, and may have the same thickness (determined between the surfaces 2a, 2b and 3a, 3b respectively).

[0132] The insulated glass units 2, 3 may be individually installed in and removed from the movable frame 20.

[0133] In one or more embodiments of the present disclosure the fixation frame 10 substantially surrounds the movable frame 20. Further the fixation frame 10 and the movable frame 20 may substantially overlap in the same plane, such as in common with the first and second insulated glass units plane PL1. Hereby as seen on fig. 3 (see also fig. 6) the plane PL1 may intersect the fixation frame 10 and the movable frame 20.

[0134] In some embodiments of the present disclosure, the mullion bar/division bar arrangement 30 may also provide a further attachment option so that two covers (not illustrated) such as blinds, e.g. roller blinds or venetian blinds, rather than one, can be installed at the interior side of the sash, as one cover such as a blind may be attached for each frame opening 4a, 4b to cover each their respective frame opening. Hence, guiding rails for guiding the fabric or the like may be placed on/attached to and extend along both side profiles 21c, 21d, and further guiding rails or the like may be attached to and extend along the division bar arrangement 30. The guiding rails prevents the covering material from falling into the room of the building due to gravity. Thereby a first cover, such as a roller blind, may comprise a fabric or other sheet material that is placed to cover the frame opening 4a, and extends between the side profile 21c and the division bar arrangement 30. A further, second cover, such as a further roller blind, may comprise a further fabric or other sheet material that is placed to cover the frame opening 4b, and extends between the division bar arrangement 30 and the side profile 21d. The covering devices may be configured to be controlled simultaneously or separate to each other by means of a control system that controls an electric motor for displacing the covering material of the respective cover.

[0135] An example of an installation method according to embodiments of the present disclosure is illustrated in fig.

4. Here, the movable frame 20 is configured to be releasably connected to the fixation frame 10 by means of a releasable hinge connection 90 as e.g. previously described. This provides that the movable frame 20 can be movably connected to, and disconnected from, the fixation frame 10.

[0136] Initially, the roof window 1 is transported to the installation site. The roof window may here be delivered substantially assembled and arranged inside a common/joint delivery packaging, such as a cardboard packaging (not illustrated). The roof window is then unpacked from the delivery package.

[0137] The installation person may then consider whether the installation process would benefit from removing one or both of the insulated glass units 2, 3 from the roof window 1, dependent on the installation location and/or installation means available.

[0138] If the installation person finds that it may be an advantage that one or both insulated glass units 2, 3 are temporarily removed during the installation process, the releasable, mechanical holding system 40, 50, 60 fixating the insulated glass units 2, 3 in the movable frame 20 of the unpacked roof window are loosened, and one or both insulated glass units 2, 3 is/are removed from the movable frame 20 of the unpacked roof window 1.

[0139] Additionally, the installation person may remove the movable frame 20 from the unpacked window by disconnecting hinge part or parts of the movable frame 20 from a hinge part or parts of the fixation frame 10, so that the movable frame 20 may be installed at the fixation frame 10 again after the fixation frame 10 has been properly installed at the roof structure.

[0140] Then the installation person arranges the fixation frame 10 at the installation location, and fixates the fixation frame 10 to the roof structure 100 of the building. The installation person then subsequently attaches the movable frame 20 to the fixated fixation frame 10 by means of the hinge arrangement 90.

[0141] Then the first insulated glass unit 2 is provided and arranged in the movable frame 20 so as to cover the first frame opening 4a of the movable frame 20. In the present case, the installation person found that it was also beneficial to temporarily remove the second insulated glass unit 3 too, and hence, the second insulated glass unit 3 is subsequently provided and arranged in the movable frame 20 of the installed frame arrangement so as to cover the second frame opening 4b of the movable frame.

[0142] Hereby, the insulated glass units 2, 3 are arranged side by side in the movable frame in the common glass unit plane PL1 as illustrated in e.g. fig. 3. The insulated glass units may be arranged in the movable frame that is connected to the fixated fixation frame by means of the hinge arrangement one by one consecutively.

[0143] Then the insulated glass units 2, 3 are secured to the movable frame 2 by means of the releasable, holding system 40, 50, 60 one by one, or simultaneously dependent on the holding system.

[0144] In some further embodiments, water covers 45, 55, 65 may also be installed.

[0145] In some embodiments of the present disclosure, the insulated glass unit 2, 3 may comprise a sealing arrangement, such as a gasket arranged at the insulated glass unit. The gasket may be used for water tightening and/or air tightening when the insulated glass unit is installed at the movable frame. A sealing arrangement may e.g. be attached to the surface 2b, 3b and/or surface 2a, 3a of the insulated glass unit.

[0146] Fig. 5 illustrates schematically a cross sectional view of a roof window 1 according to embodiments of the present disclosure, where the insulated glass units 2, 3 are installed in the movable frame 20 while the frame is in an open position. It is understood that the movable frame 20 may be connected to and hang in the fixation frame 10 by means of the hinge arrangement 90 during this, but the fixation frame 10 has been omitted from the figure for the sake of simplicity.

[0147] In fig. 5, the roof window is of the centre pivot type, such as e.g. illustrated in fig. 2.

[0148] Here, the movable frame 20 comprises an first exterior side 20a for facing the exterior 80 of the building when the movable frame 20 is in a closed position (see fig. 3), and a second interior side 20b for facing the interior 70 of the building when the movable frame 20 is in a closed position (see fig. 3).

[0149] The hinge arrangement 90 comprises a centre hinge arrangement allowing the movable frame 20 to rotate at least 45°, such as at least 90°, such as at least 120° from the closed position to an open position.

[0150] In the present example of fig. 5, the movable frame has been moved/pivoted to an open position providing that the first side 20a faces inwards towards the building interior 70.

[0151] In fig. 5, the first and second insulated glass units are hence installed in the movable frame 20 while the movable frame is in this open position.

[0152] Gravity F_g , such as a component thereof, may provide that the insulated glass units 2, 3 may be arranged in the movable frame but may fall out of the movable frame if not retained either by hand, or by a holding system, such as a secondary holding system, during the installation process.

[0153] Hence, when installing the window, the fixation frame 10 (not illustrated in fig. 5, see e.g. figs 2-4) is first fixated to the roof structure. Then the movable frame 20 may be installed/mounted movably, such as mounted pivotably around the rotation axis as previously described - see e.g. also fig. 2 - in the fixated fixation frame by means of the hinge arrangement 90.

[0154] Then the movable frame 20 is pivoted/rotated around the rotation axis so that the first side 20a faces inwards

towards the building interior 70. When the movable frame 20 is in that position, the first and/or second insulated glass units 2, 3 are installed in/secured to the movable frame 20 by an installation person from the interior of the building.

[0155] This may comprise that the person places the first insulated glass unit 2 in the movable frame 20 to cover the frame opening 4a, and then fixates the first insulated glass unit to the movable frame by means of a holding system 40, 50 so that the holding system holds the insulated glass unit around the edges of the insulated glass units.

[0156] Subsequently, if the second insulated glass unit 3 is also to be installed in the movable frame the installation person placed the second insulated glass unit 3 in the movable frame 20 to cover the frame opening 4b, and then fixates the second insulated glass unit to the movable frame by means of a holding system 50, 60 so that the holding system holds the insulated glass unit around the edges of the insulated glass units.

The water covers 45, 55, 65 may be integrated in the holding system (not illustrated), or may finally be installed at the movable frame.

[0157] Fig. 6 illustrates an embodiment of the present disclosure where the insulated glass units may be installed from the second interior side 20b, and where the releasable holding system 40, 50, 60 is an interior holding system that is accessible at the interior side 20b of the movable frame. The insulated glass units 2, 3 are thus configured to be installed in and removed from the movable frame 20 from the interior side 20b of the movable frame 20 by manipulating the releasable holding system 40, 50, 60. The releasable holding system is attached to interior parts of a plurality of the elongated profiles 21a-21d, 30 of the movable frame 20, and the releasable holding system 40, 50, 60 comprises interior elongated holding profiles 48, 58, 68 attached to said elongated profiles by means of one or more mechanical, releasable fixation members 49, 59, 69 such as one or more screws, (as illustrated), one or more nails, one or more snap-fit solutions and/or the like.

[0158] In other embodiments, the releasable holding system 40, 50, 60 may comprise one or more clamps such as one or more displaceable clamps, and a covering profile may then be arranged to visually cover these clamps upon finished window installation.

[0159] As can be seen, the holding profiles 48, 58, 68 may in embodiments of the present disclosure comprise or provide the previously mentioned lower glass unit supporting part 34 that comprises the support surface 31 which faces the outer surface 2a, 3a of the respective insulated glass unit 2, 3 that faces towards the interior 70 of the building when the movable frame 20 is closed.

[0160] A counter hold 57, 47, 67 such as elongated lists of the movable frame may be arranged at the exterior surface 2b, 3b, so that when the holding profiles 48, 58, 68 are properly fixated to the movable frame 20 and the insulated glass units 2, 3 are hence secured in the movable frame, the insulated glass units 2, 3 are held, such as clamped between the counter holds and the holding profiles.

[0161] In embodiments of the present disclosure, the holding profile 48, 58, 68 may comprise an elongated rim 48a, 58, 68a or slit extending in the longitudinal direction of the holding profile that is configured to engage with a counterpart, such as a slit or rim in the respective elongated profile 21c, 21d, 30. In fig. 6, the rim is placed at the respective holding profile, and is configured to engage with a slit in the respective profile by extending into the slit. This may help to improve alignment of the holding profile and/or help to temporarily maintain the holding profile at the respective profile of the movable frame, until the fixation members 49, 59, 69 are provided.

[0162] In some embodiments, the holding profiles 48, 58, 68 may be capable of temporarily maintain the insulated glass unit in the movable frame until an installation person provides/fixates the fixation members 49, 59, 69.

[0163] Here, the rim and slit may act as a secondary holding means for temporarily retaining the insulated glass units 2, 3 at the respective frame opening 4a, 4b, and the insulated glass units 2, 3 are hence subsequently, finally secured at the movable frame (20) by means of mechanical securing means 49, 59, 69 acting as further primary releasable means for securing the insulated glass units 2, 3 to the movable frame.

[0164] A tightening system 13 such as a resilient gasket, an elastomer tightening, a butyl material and/or the like as previously mentioned may be provided to ensure water tightness between the movable frame and the insulated glass unit 2, 3 at the exterior side 20a.

[0165] The same applies for the interior side 20b, where one or more resilient gaskets 32 or the like may be placed, e.g. between the holding profiles 48, 58, 68 and the like may be placed to assure water tightness and/or air tightness at the interior side 20b.

[0166] The counter holds may be maintained connected to the movable frame 20 through the roof window installation process, and an installation person may hence press/push the insulated glass units towards the counter holds from the interior side 20b when installing the insulated glass units in the respective frame opening 4a, 4b. The counter holds 57, 47, 67 may be integrated in the movable frame or be releasable connected thereto.

[0167] In some further embodiments, the installation person may after installation of the insulated glass units 2, 3 in the movable frame, in some embodiments, provide water covers 45, 55, 65 and/or water tightening 13, such as further water tightening (e.g. by means of gaskets and/or elastomer material) at the outer surface 20a of the movable frame, either from the exterior side of the roof structure while the side 20a faces outwards, or by rotating the movable frame 20 so that the side 20a faces inwards as previously described. However, the water covers 45, 55, 65 may in embodiments

of the present disclosure where the releasable, mechanical holding system 40, 50, 60 is placed at the interior side 20b not be removed during the installation process as illustrated in fig. 6.

[0168] Figs. 7-9a illustrates various embodiments of the present disclosure, wherein the holding system 40, 50, 60 comprises secondary holding means 42, 52, 62 which are present as further securing means as an addition to primary securing means.

[0169] In fig. 7. The secondary holding means 42, 52 are provided at the movable frame 20. The figure schematically illustrates a part of the movable frame 20 comprising only the insulated glass unit 3 for improved figure simplicity.

[0170] The secondary holding means 42, 52 here comprises displaceable holding means, where a plurality of holding means, in the present example comprising a turn knob solution is provided.

[0171] Hence, when the movable frame 20 is rotated when connected to the fixation frame 10 so that the outer surface 20a faces inwards towards the building interior, an installation person can place the insulated glass unit 2, 3 in the movable frame 20 to cover the desired frame opening 4a, 4a (see previous figs.), and manipulate/trigger the turn knobs so that these extend in over the relevant insulated glass unit 2, 3. Then, the installation person can let go of the insulated glass unit as it will now be temporarily held in the movable frame and not fall way form the movable frame due to gravity, and the installation person may then install the other insulated glass unit in the movable frame in the same manner by means of secondary holding means (not illustrated in fig. 7). These secondary holding means 42, 52 may then hold the insulated glass units temporarily in the movable frame until the installation person installs/reinstalls the primary securing means (not illustrated in fig. 7) such as glazing beads so that the insulated glass unit is properly secured to the movable frame in a water tight manner.

[0172] It is understood that in embodiments of the present disclosure, the secondary holding means such as displaceable holding means may be activated/operated automatically or by one hand only without any tools or fasteners. These displaceable holding means may e.g., in embodiments of the present disclosure, comprise one or more of clamps, snap keeper, turn knobs, slider locks or similar known hardware. The displaceable holding means may be displaceable between two configurations, a first configuration where the insulated glass unit is released and can be moved from the movable frme, and a second configuration where the insulated glass unit is secured to the movable frame 20. The displaceable holding means may in some embodiments also cooperate with other holding elements. For example one side of the insulated glass unit may be held by a glass overlapping fitting (not shown) while the opposite side of the insulated glass unit is held by the displaceable holding means.

[0173] Fig. 8a-8b illustrates schematically a cross sectional view of another embodiment of the present disclosure, wherein movable frame 20 comprises secondary holding means comprising a snap-fit solution. Here, resilient displaceable holding means 52 are provided. These secondary holding means may be attached to and/or integrated in the movable frame construction. Hence, an installation person may by hand or by means of a tool, or by means of the insulated glass unit itself dependent on the constitution of the resilient holding means 52, temporarily displace the resilient holding means 52, and when the insulated glass unit 2 is in its intended position, the resilient holding means 52 "snaps" into position due to the resiliency of the resilient holding means 52, thereby providing that a part of the resilient holding means 52 overlaps a part of the surface 2b of the glass unit 2. This may be provided at two, three, four locations or more locations around the respective insulated glass unit, thereby providing that these together holds the respective insulated glass unit temporarily in the movable frame 20 until the installation person installs/reinstalls the primary securing means (not illustrated in fig. 8a). Fig. 8b then illustrates that the primary securing means 51, such as a glazing bead, are installed and proper water tightening 13 may hereby be provided. The primary securing means 51 may be attached to the movable frame by means of mechanical, releasable securing means such as screws, nails, a clamping arrangement or the like.

[0174] As can be seen, the primary securing means 51 are to be considered separate to the secondary holding means 52, and hence, when a person e.g. wants to remove the insulated glass unit from the frame 20, the user may first need to remove the primary securing means 51, and then deactivate/manipulate the secondary holding means 52 before the person is able to remove the glass unit from the movable frame.

[0175] The secondary holding means may in some embodiments of the present disclosure only provide limited or no holding of the insulated glass unit when the primary securing means 51 has been installed.

[0176] In figs. 7-8b, the movable frame 20 may upon delivery comprise the secondary holding means 42, 52 attached thereto and ready for use.

[0177] Figs. 9a-9b illustrates schematically an embodiment of the present disclosure, where individual secondary holding means comprises a clips/clamp arrangement that may be arranged, such as snapped, into engagement with the movable frame and here hold the glass unit. Hence, an installation person may arrange the insulated glass unit to cover the frame opening, and then install the secondary holding system comprising so that it engages with the movable frame. Here, it may as illustrated snap into engagement with a receiving slit or opening 75 in the movable frame. It is generally understood that different snap-fit solutions and holding means designs may be used in order to enable a safe secondary holding of the insulated glass unit in the frame. The secondary holding means may then be disconnected from the movable frame again, should a person desire to remove the insulated glass units from the movable frame. Fig. 9b illustrates an embodiment where both the primary glass overlapping securing means 51, in this example an elongated

glazing bead, and a water cover 55 is installed. The water cover 55 is placed to cover the primary securing means 51, and these primary securing means 51 are arranged to cover the secondary holding means 52.

[0178] Hence, a method of installing the roof window may comprise:

Initially using a secondary holding system, 42, 52, such as retaining parts such as clamps, for temporarily retaining the insulated glass units 2, 3 at the respective frame opening 4a, 4b, and subsequently securing the insulated glass units 2, 3 held by the secondary holding system at the movable frame 20 by means of the further primary, releasable, mechanical securing means 41, 51, 61 such as glazing beads, for securing the insulated glass units 2, 5 to the movable frame, preferably in a water tight manner. It is understood that the water tightening 13 may either be pre-mounted/pre-adhered to the IGU at the outer surface 2b, 3b, or may be pre-mounted/pre-adhered to the securing means 41, 51, 61 such as glazing beads, e.g. in a recess of the securing means as illustrated, such as a channel or slit. Alternatively, the installation person may provide the water tightening 13 before mounting the securing means 41, 51, 61.

[0179] It may generally be relevant to provide a solution that may help to ensure that the insulated glass units 2, 3 are not installed with the wrong outer surface facing the exterior, as the present disclosure relates to a roof window where an installation person may provide installation of the insulated glass units in the movable frame 20. Insulated glass units may comprise a constitution as previously explained where e.g. the outer glass sheet 6a may be thicker than the other glass sheets and/or may be tempered. Additionally or alternatively, the inner glass sheet 6d may be a lamination glass helping to assure that glass pieces may not fall towards the room of the building in case the insulated glass unit is shattered.

[0180] Hence, if an installation person by mistake installs the insulated glass units 2, 3 so that the glass sheet 6a by mistake faces inwards, this may reduce safety.

[0181] Accordingly, the roof window may in embodiments of the present disclosure be designed with measures so that the chances of correct glass unit 2, 3 installation is increased. This may e.g. be provided by means of markings and/or by means of one or more shapes that may prevent "wrong side installation".

[0182] Different embodiments of such measures are disclosed in figs. 10-12, according to various embodiments of the present disclosure.

[0183] In fig. 10 and 11 a shape restricts wrong side install. Here, the shape is provided by means of a protrusion 110 of the movable frame 20, and this protrusion extends into a stepped shape 120, such as a recess of the insulated glass unit 2. In fig. 10, the stepped shape is provided by making the lamination glass sheet 6d slightly smaller than the other glass sheets 6a-6c of the insulated glass unit 2, thereby providing a space into which the protrusion 110 of the frame may extend. In fig. 11, the stepped shape is provided by making the lamination glass sheet 6d, and the glass sheet 6c slightly smaller than the other glass sheets 6a-6b of the insulated glass unit 2. The edge seal 9 is hence arranged with a distance to the outer edge of the intermediate glass sheet 6b. This provides a larger space into which the protrusion 110 of the frame may extend. If the insulated glass unit 2 was tried to be installed with the surface 2b facing the interior 70 (when the movable frame is in a closed position) instead, the insulated glass unit 2 could not be installed correctly as the protrusion 110 would prevent the glass unit 2 from this since the size of the glass sheet 6a is larger. Moreover, the secondary holding means and/or the primary holding means as previously described may in some embodiments not be able to extend over and hold the glass unit if the insulated glass unit 2 was tried to be installed with the surface 2b facing the interior 70 (when the movable frame is in a closed position). The installation person would discover that the insulated glass unit 2, 3 does not fit properly in the frame and hence either consult the instruction manual and here be informed of the mistake, or alternatively, due to intuition, figure out that the orientation of the glass unit should be changed so that the surface 2b faces outwards instead.

[0184] It is generally to be understood that the edges of the insulated glass unit(s) to be installed in some embodiments of the present disclosure may be processed and blunt. For example each glass pane edge may be polished, grinded and/or as double chamfered (e.g. at the glass unit manufacturing location). This may help to reduce the risk of installation persons getting harmed by cutting or the like on edges or corners of the insulated glass unit(s) during installation in the movable frame.

[0185] Fig. 12. illustrates a further embodiment of the present disclosure. Here, the insulated glass unit comprises a peripheral enclosure arrangement 130, 140 comprising a polymer edge material 130. Here, the insulated glass unit comprises a securing arrangement 140 that is configured so that the insulated glass unit 2 can be fixated/secured to the frame profile 21c of the movable frame 20 by means of mechanical fastening means 145 such as screws. Such a solution is disclosed in more details in patent document EP2188462 B1. The securing arrangement 140 may comprise an elongated, angular part such as a metal or polymer profile, comprising walls/lips 140a, 140b, where a first part 140a of this is embedded in or attached to the polymer edge material 130. A second part 140b extends away from the insulated glass unit, e.g. so as to be attached to and/or so as to abut a surface 150 of the movable frame facing away from the frame opening.

[0186] The securing arrangement 41 disclosed in fig. 12 may be considered a re-usable mechanical securing means, here, the securing arrangement may in some embodiments as illustrated comprise a glass overlapping part 140a that is the one that is attached to the insulated glass unit 2 by means of the polymer edge 130. In further embodiments, an adhesive may be used for this and the polymer edge may be omitted.

[0187] In this embodiment, the securing means 140 are fixed to the insulated glass unit and hence, an installation person may remove the insulated glass unit from the movable and install it at the movable frame by means of the mechanical fastening means 145 such as one or a plurality of screws. These may be configured to extend into pre-provided screw holes 146, or these screw holes may alternatively be provided during the first insulated glass unit installation by a self-cutting screw 145. The securing arrangement 140 may comprise recesses or through going openings for receiving such mechanical fastening means 145. In some embodiments of the present disclosure (not illustrated in fig. 12), the mechanical fastening means 145 may comprise a clamp for engaging with a lip or protrusion of the securing arrangement 140 so as to secure the insulated glass unit to the movable frame.

[0188] The securing arrangement 140 provides a shape that helps to restrict/prevent wrong side install as the second part 140b extends away from the insulated glass unit and intuitively indicates the orientation of the insulated glass unit.

[0189] As can be seen, the polymer edge material 130 may in further embodiments comprise a protrusion 160 such as a ridge or tongue that is configured to extend into a recessed portion 161 such as a groove of the movable frame 20. This may help to provide improved alignment of the insulated glass unit 2 during installation. In other embodiments, the movable frame may naturally comprise the protrusion, and the polymer edge material may comprise the recessed portion such as a groove.

[0190] Fig. 13 illustrates an embodiment of the present disclosure, where a side of the insulated glass unit is marked in order to prevent wrong side install, and hereby assure that the correct side of the insulated glass unit, such as a side comprising a lamination glass, faces the interior of the building when the movable frame is in a closed position. Here, a removable marking/label 170 such as a sticker or the like, is attached to a major surface of the insulated glass units 2, 3, and are in the present example visible when the insulated glass units 2, 3 are installed in the frame 20. The marking 170 comprises information 171 such as one or more of image, photo, sign and/or writing, indicating whether the side of the insulated glass unit at which the marking 170 is installed, should face inwards or outwards. For example, information such as "This side out", "This surface out when window is closed" or the like may be provided as information 170. Additionally or alternatively, a machine readable code, such as a QR code or a barcode may be provided at the marking as a part of the information 171, and when read by a device, such as a hand held device, such as a smartphone, or the like, (e.g. by means of a camera at that device) it may redirect a user to further installation information by means of an app installed at the device or by means of an internet browser.

[0191] It is understood that in some embodiments, markings 170 comprising information 171 may be placed at both sides 2a, 2b of the insulated glass units. The information at these may be slightly different in order to inform the installation person of orientation information relating to the insulated glass unit.

[0192] In some embodiments, the marking(s)/label(s) 170 may be considered and/or configured to be, permanent, and hence in some embodiments the marking(s) may be partly or fully hidden in the frame 20. In further embodiments, both removable and permanent markings may be provided.

[0193] Fig. 14 illustrates an embodiment of the present disclosure, where the movable frame comprises four individual insulated glass units that may be installed in each their area and cover each their frame opening of the movable frame. Here, the insulated glass units does not extend at least 70%, such as at least 80%, such as at least 90% of the entire height of the movable frame 20. Instead a transverse division bar arrangement 230 extends parallel to the width direction WD of the roof window 1 between sides of the movable frame 20 and a division bar arrangement 30 that extends in the height direction HD of the window. The transverse division bar arrangement 230 extends in the width direction WD of the movable frame between the previously mentioned top and bottom profiles 21a, 21b, see fig. 2. The transverse division bar arrangement 230 may generally be provided as e.g. previously disclosed and securing means such as primary securing means and/or secondary holding means may in some embodiments be attached thereto, and the same applies for the previously mentioned water covers.

[0194] Figs. 15a-15b illustrates embodiments of the present disclosure wherein the roof window 1 comprises three elongated insulated glass units arranged side by side to cover each their frame opening 4a-4c, where the frame openings are divided by each their division bar arrangement 30 extending in the height direction HD between the top and bottom profiles 21a, 21b (see fig. 2) of the movable frame 1. The insulated glass units extends at least 70%, such as at least 80%, such as at least 90% of the entire height of the movable frame in the height direction HD. In some embodiments, as e.g. illustrated in figs. 1-3, the movable frame 20 may comprise just one division bar arrangement 30 extending in the height direction HD of the movable frame, and hence two insulated glass units 2, 3 extending at least 70%, such as at least 80%, such as at least 90% of the entire height of the movable frame in the height direction HD.

[0195] Fig. 16 illustrates an embodiment of the present disclosure wherein the division bar arrangement 30 is attached to one of the insulated glass units, in this case the unit 2, so that when that glass unit 2 is installed at the movable frame, the division bar arrangement 30 is also installed thereby. This provides that the division bar arrangement divides the overall frame opening between the opposing outer surfaces 22 of the respective side profiles 21c, 21d of the movable frame 20 that faces the into the two frame openings 4a, 4b as illustrated in the figures previously described. The division bar arrangement 30 may here be pre-attached to the glass unit by means of a releasable mechanical holding system 50, such as e.g. previously described. However, additionally or alternatively, in embodiments of the present disclosure,

an adhesive and/or a moulding material may fixate the division bar arrangement 30 to the glass unit.

[0196] When installing the glass unit 2, the ends or end parts of the division bar arrangement 30 may engage (not illustrated) with a recess or another engagement interface or the like of the top and bottom profiles, or the side profiles, of the movable frame dependent on the extension direction of the division bar arrangement. The division bar arrangement 30 may hence in some embodiments mechanically engage with one or more of the top and bottom or side profiles, and be fixed thereto. This fixation between the division bar arrangement 30 and the respective top, bottom and/or side profiles of the movable frame may preferably be releasable so that the glass unit and division bar arrangement attached thereto can be removed again and e.g. exchanged. This fixation between the division bar arrangement 30 and the respective top, bottom and/or side profiles of the movable frame may in some embodiments involve utilizing mechanical fastening means such as screws or nails, or alternatively or additionally a latch/notch solution or the like. A holding system such as of a type previously described, or the like, may additionally or alternatively be used for this purpose.

[0197] It is furthermore understood that in some embodiments of the present disclosure, the movable frame may be of a design for accommodating both regular "full size" insulated glass units too, and hence, a visible interface part at these components for connecting with the division bar arrangement may be omitted at the respective top, bottom and/or side profiles, or at least such interface may be made of only reduced visibility (e.g. by small markings, recesses, indications or the like). A person ordering the window may hereby determine whether a division bar arrangement 30 solution is needed or not, as the movable frame may e.g. be used for both types.

[0198] After installing the division bar 30 and glass unit 2 part/assembly, the second glass unit 3 may be installed. Here, the second glass unit may be installed substantially as e.g. illustrated in fig. 5.

[0199] In other embodiments as seen in e.g. fig. 4, the movable frame 20 may comprise the division bar arrangement 30 so that the division bar arrangement 30 is arranged between and separates neighbouring/adjacent frame openings such as the openings 4a, 4b, 4c of the movable frame as e.g. previously described. Here, the division bar arrangement 30 may be pre-attached to, such as integrated in, the movable frame for example already when leaving the frame manufacturing factory.

[0200] Fig. 17 illustrates schematically roof windows according to embodiments of the present disclosure, substantially similar to the roof window of fig. 2, see also the description to fig. 2. The frame arrangement 10, 20 may here generally be of the same constitution as previously described in relation to various embodiments of the present disclosure. However, in fig. 17 the division bar arrangement 30 is omitted. As a consequence of this, an entire, whole, full size insulated glass unit 2 is to be installed in the movable frame 20 after installation of the frame arrangement 2, 3 in the roof structure, so as to cover the frame opening 4a of the movable frame.

[0201] Fig. 18 illustrates schematically a cross sectional view of a roof window 1 of the type illustrated in fig. 17, according to further embodiments of the present disclosure. Here, the movable frame 20 is in a closed position and a "full size" insulated glass unit 2 is installed at the movable frame 20 to cover the frame opening extending between the outer opposing surfaces 22 of the respective side profiles 21c, 21d of the movable frame 20 that faces the frame opening 4a, and between similar outer surfaces 22 (not illustrated in fig. 18) of the top and bottom profiles 21a 21b (see fig. 17) of the movable frame 20 that faces the frame opening 4a.

[0202] Generally the installation of the full size insulated glass unit 2 as illustrated in fig. 17 and 18 may be provided according to one or more embodiments of the present disclosure as described above, where the insulated glass unit 2 is installed in the movable frame 20 after the frame arrangement, including the movable frame 20, is installed in the building roof structure.

[0203] The full size insulated glass unit 2 may also e.g. comprise three or more glass sheets and one or more insulating gaps 8a, 8b placed between major surfaces of the glass sheets as previously described. One or more of the glass sheets of the full size insulated glass unit may be tempered or annealed, and a lamination glass may be provided e.g. as generally described in relation to and/or described in Table. 1 above of the present disclosure.

[0204] In other embodiments of the present disclosure, a "full size" insulated glass unit may be installed in the movable frame as illustrated in fig. 17 and/or 18, and the movable frame 20 may here comprise a division bar arrangement 30, 230 (or the division bar arrangement may be attached to the glass unit and be configured to engage with the movable frame upon installation of the glass unit) which may support (not illustrated) the full size insulated glass unit 2, e.g. around a centre portion/line of the insulated glass unit. The insulated glass unit 2 would hence extend in over the division bar arrangement 30, preferably with undivided glass sheets, and cover both frame openings 4a, 4b (see e.g. fig. 3). Hereby the glass unit is supported by the division bar arrangement. The first and second frame openings 4a, 4b as previously described would still be provided due to the presence of the division bar arrangement, but only a single insulated glass unit is installed in the same glass unit plane PL1 (see e.g. PL1 in fig. 3). This may for example help to allow providing thinner glass sheets of the insulated glass unit, and hence help to provide a reduced glass unit weight. In some embodiments, a spacer arrangement (not illustrated) may here be arranged opposite to and extending along the longitudinal direction of the division bar arrangement inside the glass unit interior so that support forces can be transferred to multiple, spaced apart glass sheets of the insulated glass unit at a position above/opposite to the division bar arrangement 30.

[0205] Figs. 19a-19d illustrates how the roof window 1 components may be delivered/received at the site of the building

comprising the roof structure 100 where an opening 110 in which the roof window 1 should be placed is provided or should be provided.

[0206] Generally, in the figs 19a-19d, the one or more insulated glass units 2, 3, either a single full size insulated glass unit as illustrated in figs. 17-18 or several insulated glass units 2, 3 as previously described, are delivered at the site in one or more glass unit packages 320, 330, 350. The insulated glass unit(s) is/are placed in a protective glass unit packaging. The frame arrangement 10, 20 comprising the movable frame 10 and the fixation frame 20 are delivered in another separate frame package 310 so that the frame arrangement is placed inside a protective frame packaging of the frame package 310. The one or more insulated glass units 2,3 is/are hence placed in a protective glass unit packaging of the glass unit package 320, 330, 350 that is separate to the protective frame packaging. Hereby the frame package 310 and the glass unit package 320, 330, 350 can be individually transported prior to unpacking of their respective roof window content 10, 20, 2, 3 from the respective protective packaging.

[0207] In an embodiment of the present disclosure as illustrated in fig. 19a, 19b and 19c, the frame package 310 and the glass unit package(s) 320, 330, 350 are delivered as loose individually portable packages at the building site.

[0208] In fig 19a, the roof window is of the type where a division bar 30 is provided as previously described according to various embodiments of the present disclosure, and the respective insulated glass unit 2, 3 is delivered in each their respective glass unit package 320, 330. The frame package 310 is separate thereto.

[0209] In fig. 19b, the glass unit to be installed is a full size glass unit 2 (see e.g. figs. 17 and 18 and the description thereto), and this glass unit is delivered in a glass unit package 320 comprising a separate protective packaging separate to the protective packaging of the frame package 310.

[0210] In fig 19c, the roof window is of the type where a division bar 30 is provided as previously described according to various embodiments of the present disclosure, but here, a common glass unit package 350, such as comprising a protective common packaging, containing several glass units for installation in the movable frame 20 of the frame package is provided. In the illustrated embodiment each glass unit 2, 3 is placed in it's own packaging 320, 330 comprising a protective respective packaging inside the common glass unit package 320, but in other embodiments, the individual protective glass unit packaging 320, 330 may be omitted from the common packaging 350 and by opening the common packaging 350, the glass units may be exposed. The common package 350 is again here separate to the frame package 310 and can be transported, such as lifted by hand, separate to the frame package 310.

[0211] In fig. 19c, the roof window 1 is delivered in an overall common package 340. This package contains the glass unit package or packages 320, 330 and/or 350, and also the frame package 310. When the common roof window package 340 is unpacked, the frame package 310 and the glass unit package(s) 320, 330 is/are exposed and individually portable prior to unpacking of their respective content 10, 20, 2, 3 from the respective protective packaging of the frame package 310 and the glass unit package(s) 320, 330, 350.

[0212] In still further embodiments of the present disclosure, the frame package may constitute the common package 340. Hence, inside the frame package, the one or more glass unit package(s) 320, 330 are exposed. When opening the frame package, the frame arrangement 10, 20 may hence be exposed, but the one or more glass unit package(s) 320, 330 packaging(s) may still be maintained substantially intact. Hence, a person can move the glass unit package(s) while kept in the glass unit package, and may take the exposed fixation frame and/or movable or installation in the roof structure. Hence, an installation person may even wait with unpacking the insulated glass unit(s) from the glass unit package(s) until after the frame arrangement 10, 20 is installed.

[0213] In embodiments of the present disclosure, the glass unit(s) may be delivered unattached or only temporarily attached to the movable frame at delivery, so that a user/installation person may more easily separate the parts of the window according to embodiments of the present disclosure. The glass unit(s) may be delivered in the mentioned glass unit packaging(s), but it may also alternatively be delivered substantially exposed and fully or only partly attached to the movable frame upon delivery. Here, the glass unit(s) may be placed in the frame package together with the frame.

[0214] Generally, the frame package 310, the at least one glass unit package 320, 330, 350 and/or the common roof window package 340 may comprise various types of suitable packaging materials such as protective materials preventing/reducing scratches and/or undesired marks/deformations of the roof window component(s) 2, 3, 10, 20 during transport. Examples hereof may comprise a protective cardboard sheet or cardboard box enclosing the respective package 310, 320, 330, 340, 350 content 2, 3, 20, 10, 320, 330, 310. Another example may comprise a plastic sheet material such as a plastic sheet enclosing, such as wrapped around, the respective package 310, 320, 330, 340, 350 content 2, 3, 20, 10, 320, 330, 310. A further example may comprise a shock absorbing material such as a foamed material, such as one or more of a polyurethane or polystyrene material, located inside said respective package 310, 320, 330, 340, 350 so as to increase mechanical protection of the package content 2, 3, 20, 10, 320, 330, 310.

[0215] Naturally, such packaging materials may be combined so that e.g. a combination of the cardboard material and the shock absorbing material and/or a combination of the plastic material and the shock absorbing material is used for providing the protective packaging. In other embodiments, a single of said materials may be used, such as for example the cardboard material, e.g. as this may be more environmental friendly and provide more easy recycling. In further embodiments, other suitable packaging materials may be used for one or more of said packages.

[0216] While the present disclosure has been described in detail in connection with only a limited number of embodiments or aspects, it should be readily understood that the present disclosure is not limited to such disclosed embodiments or aspects. Rather, the present disclosure can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate in scope with the present disclosure. Additionally, while various embodiments or aspects of the present disclosure have been described, it is to be understood that aspects of the present disclosure may include only some of the described embodiments or aspects or combinations of the various embodiments or aspects. Accordingly, the present disclosure is not to be seen as limited by the foregoing description.

Claims

1. A method of providing a roof window (1) at a roof structure (100) of a building, wherein the method comprises the steps of:

- providing a frame arrangement (10, 20) wherein said provided frame arrangement (10, 20) comprises a fixation frame (10) and a movable frame (20) for holding at least one insulated glass unit (2, 3), wherein the movable frame (20) is configured to be movably connected to the fixation frame (10) by means of a hinge arrangement (90) and wherein the movable frame (20) comprises structural elongated profiles comprising an elongated top profile (21a), an elongated bottom profile (21b) and parallel, elongated side profiles (21c, 21d),
- installing the frame arrangement (10, 20) in the roof structure (100),
- providing at least one insulated glass unit (2, 3) for installation in the movable frame (20), and arranging the at least one insulated glass unit (2, 3) in the movable frame (20) of the installed frame arrangement, and
- securing said at least one insulated glass unit (2, 3) to the movable frame (2) of the installed frame arrangement by means of a releasable, mechanical holding system (40, 50, 60).

2. The method according to claim 1, wherein said step of installing the frame arrangement (20, 10) at the roof structure (100) comprises fixating the fixation frame (10) to the roof structure, and subsequently attaching the movable frame (20) to the fixated fixation frame (10) by means of the hinge arrangement (90).

3. The method according to claim 1, wherein said step of installing the frame arrangement (20, 10) at the roof structure (100) comprises installing the frame arrangement at the roof structure (100) while the movable frame (20) is connected to the fixation frame (10) by means of the hinge arrangement (90).

4. The method according to any of the preceding claims, wherein the movable frame (20) comprises an exterior side (20a) for facing the exterior (80) of the building when the movable frame (20) is in a closed position, and an interior side (20b) for facing the interior (70) of the building when the movable frame (20) is in a closed position, wherein the hinge arrangement (90) comprises a centre hinge arrangement allowing the movable frame (20) to rotate at least 45°, such as at least 90°, such as at least 120° from the closed position to an open position.

5. The method according to claim 4, wherein said arranging of the at least one insulated glass unit (2, 3) in the movable frame (20) of the installed frame arrangement is provided at least partly by an installation person from the interior of the building while the movable frame (20) is in the open position and wherein said releasable, mechanical holding system (40, 50, 60) is located at and accessible from an exterior side (20a) of the movable frame, where said exterior side (20a) is configured for facing the exterior (80) of said building when the movable frame (20) is in a closed position.

6. The method according to any of the preceding claims, wherein the step of securing the at least one insulated glass units (2, 3) to the movable frame (20) by means of the releasable, mechanical holding system (40, 50, 60) comprises utilizing a secondary holding system, (42, 52), such as displaceable holding means, for temporarily retaining the at least one insulated glass unit (2, 3) at the frame opening (4a, 4b), and subsequently securing the at least one insulated glass unit (2, 3) at the movable frame (20) by means of further primary releasable, mechanical securing means (41, 51, 61) for securing the at least one insulated glass unit (2, 5) to the movable frame.

7. The method according to any of the preceding claims, further comprising

- unpacking the roof window (1) from a delivery package (310, 340),
- loosening a releasable, mechanical holding system (40, 50, 60) arranged to fixate one or more insulated glass

units (2, 3) in the movable frame (20) of the unpacked roof window, and

- removing the at least one insulated glass unit (2, 3) from the movable frame (20), prior to installation of the frame arrangement.

8. A roof window (1) according to any of the preceding claims, where the at least one insulated glass unit (2, 3) has a front side and a back side and where a side is marked and/or where a shape prevents, wrong side install.

9. The method according to any of the preceding claims, wherein said providing of the frame arrangement (10, 20) comprises receiving a frame package (310) at the site of the building comprising said roof structure (100), wherein the received frame package (310) comprises at least the movable frame (20) placed inside a protective frame packaging of the frame package (310), such as wherein said frame package moreover comprises the fixation frame (10) in said protective frame packaging, wherein said providing of at least one insulated glass unit (2, 3) for installation in the movable frame (20) comprises receiving at least one glass unit package (320, 330) at the site of the building comprising said roof structure (100), wherein the received at least one glass unit package (320, 330 350)) comprises one or more insulated glass units (2, 3) for installation in said movable frame (20) of the received frame package (310), and wherein said one or more insulated glass units (2, 3) is/are placed in a protective glass unit packaging of the at least one glass unit package (320, 330, 350) separate to the protective frame packaging.

10. The method according to claim 9, wherein said frame package (310) and said at least one glass unit package (320, 330, 350) are configured to be individually portable prior to unpacking of their respective roof window content (10, 20, 2, 3) from the respective protective packaging of the frame package (310) and the at least one glass unit package (320, 330, 350).

11. The method according to claim 9 or 10, wherein the frame package (310) and the at least one glass unit package (320, 330, 350) are delivered inside a common packaging, such as a common protective packaging, of a common roof window package (340) at the building site, and wherein the common roof window package (340) is unpacked so that said frame package (310) and/or said at least one glass unit package (320, 330) is/are exposed and individually portable prior to unpacking of the respective content (10, 20, 2, 3) from the respective protective packaging of the frame package (310) and/or the at least one glass unit package (320, 330, 350).

12. The method according to claim 9, wherein the frame package (310) and the at least one glass unit package (320, 330, 350) are delivered as substantially loose individually portable packages at the building site.

13. The method according to any of the preceding claims, wherein the total weight of the roof window (1), is more than 35 kg such as more than 45 kg, for example more than 65 kg, wherein the total weight of the roof window comprises or consists of the total weight of said one or more glass units (2, 3) for installation in the movable frame (20), the weight of the movable frame (20) and the weight of the fixation frame (10).

14. The method according to any of the preceding claims, wherein the movable frame (20) or a glass unit (2, 3) comprises a division bar arrangement (30, 230) wherein said division bar arrangement (30, 230) is configured so as to be arranged between and separate a first frame opening (4a, 4b, 4c) and a second frame opening (4a, 4b, 4c) of the movable frame (20), such as wherein said arranging of the at least one insulated glass unit (2, 3) in the movable frame (20) comprises that separate individual insulated glass units (2, 3) are installed at said first and second frame openings (4a, 4b, 4c).

15. A set of roof window components (2, 3, 10, 20) for a roof window for installation in a roof structure (100), said set comprising:

- a frame package (310) comprising at least a movable frame (20) placed inside a protective frame packaging of the frame package (310), such as wherein said frame package moreover comprises a fixation frame (10) in said protective frame packaging, and
- at least one glass unit package (320, 330) comprising one or more insulated glass units (2, 3) for installation in said movable frame (20) of the frame package (310), and wherein said one or more insulated glass units (2, 3) is/are placed in a protective glass unit packaging of the at least one glass unit package (320, 330, 350) separate to the protective frame packaging,

such as so that said frame package (310) and said at least one glass unit package (320, 330, 350) are configured

to be individually portable prior to unpacking of their respective roof window content (10, 20, 2, 3) from the respective protective packaging.

5 **16.** A set of roof window components (2, 3, 10, 20) according to claim 15, wherein the frame package (310) and the at least one glass unit package (320, 330, 350) are placed inside a protective packaging of a common roof window package (340), and wherein the common roof window package (340) is configured to be unpacked so that said frame package (310) and/or said at least one glass unit package (320, 330) is/are exposed and individually portable prior to unpacking of the respective content (2, 3, 20, 10) from the respective protective packaging.

10 **17.** Use of the content of said packages (310, 320, 330, 340, 350) of the set according to any of claims 15 or 16 for installation of a roof window in a roof structure of a building with a roof pitch larger than 8° such as larger than 15°, wherein said installation of the roof window is provided by means of a method of any of claims 1-14.

15

20

25

30

35

40

45

50

55

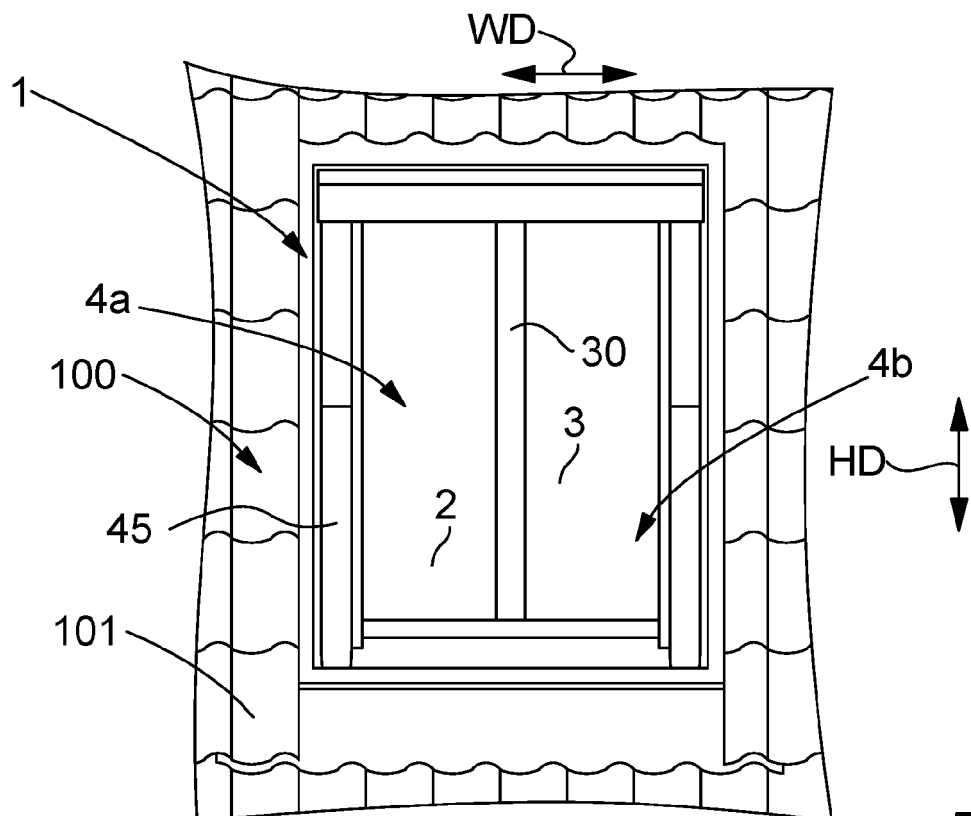


Fig. 1

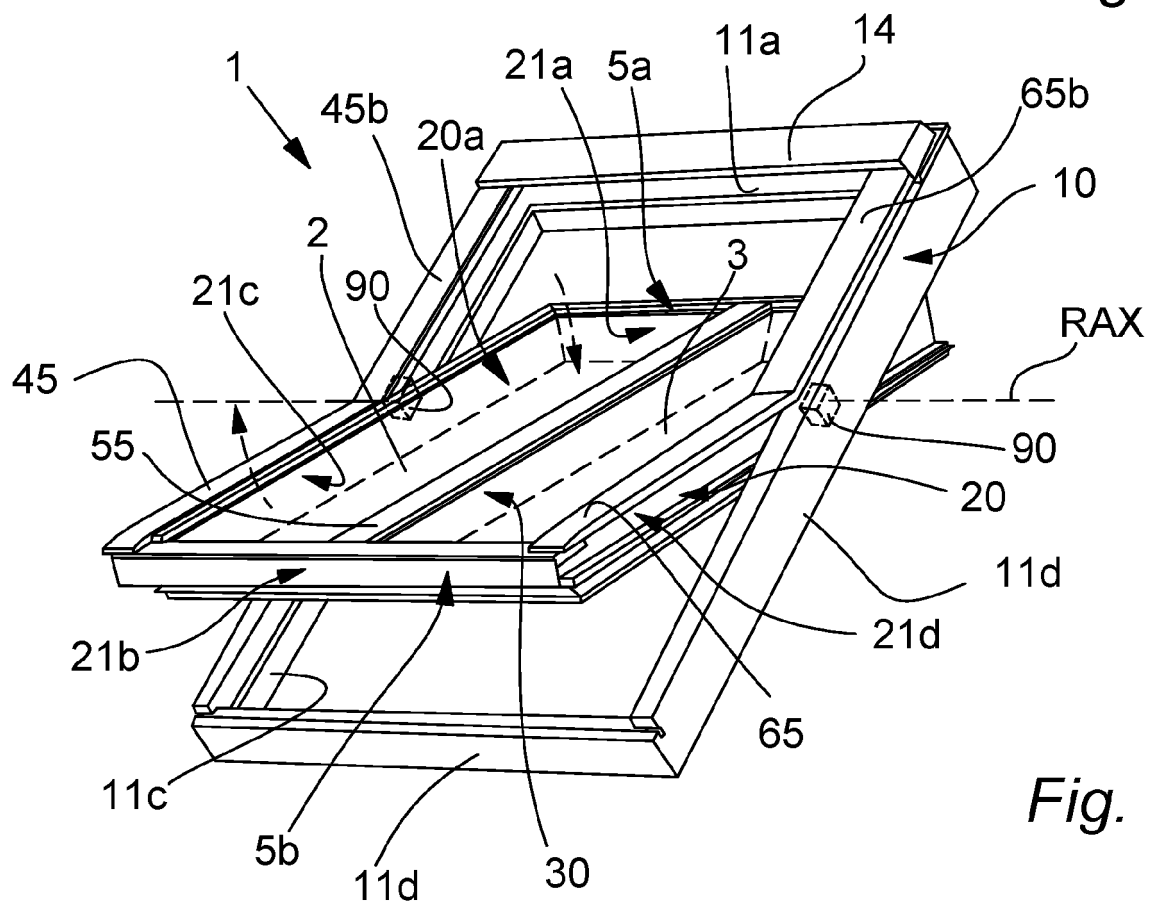
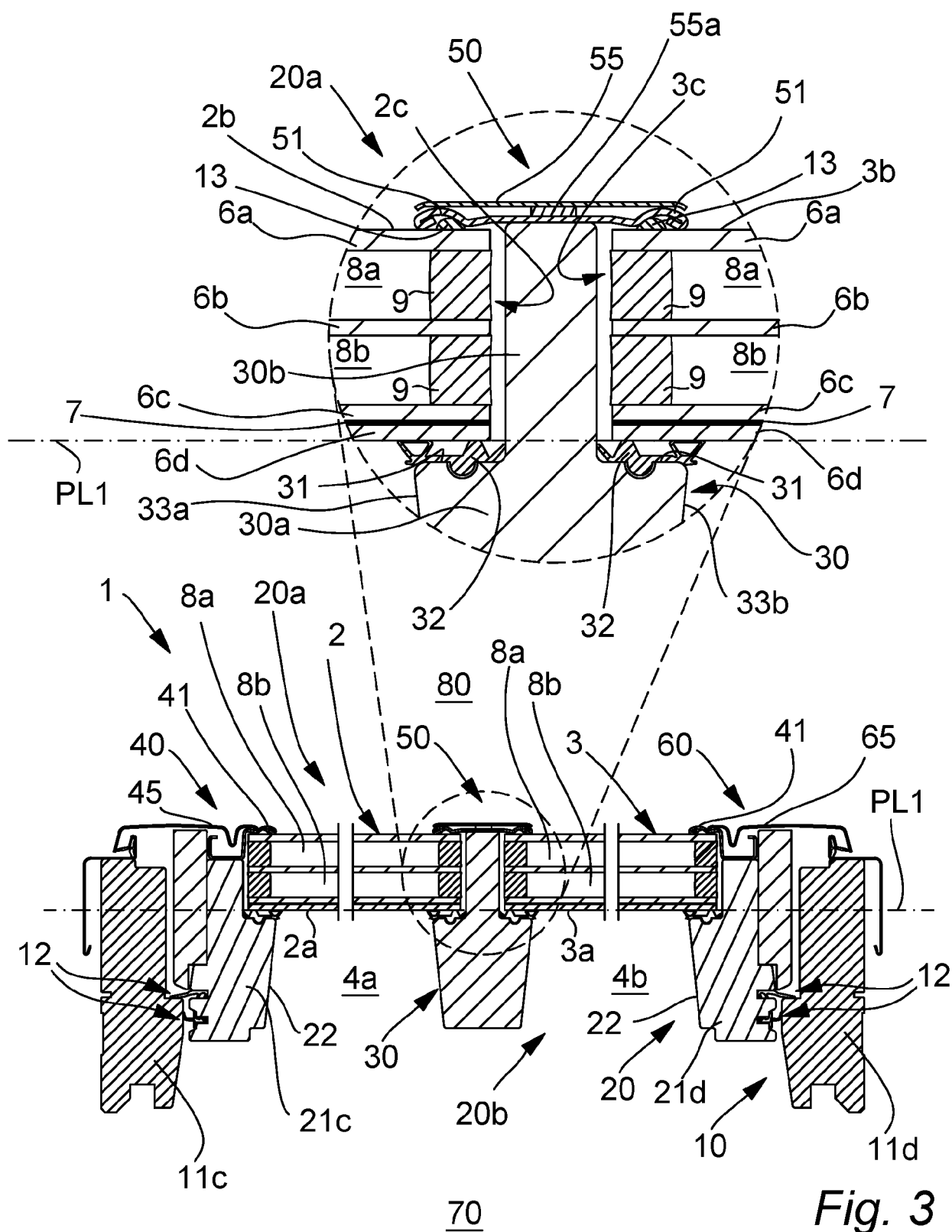
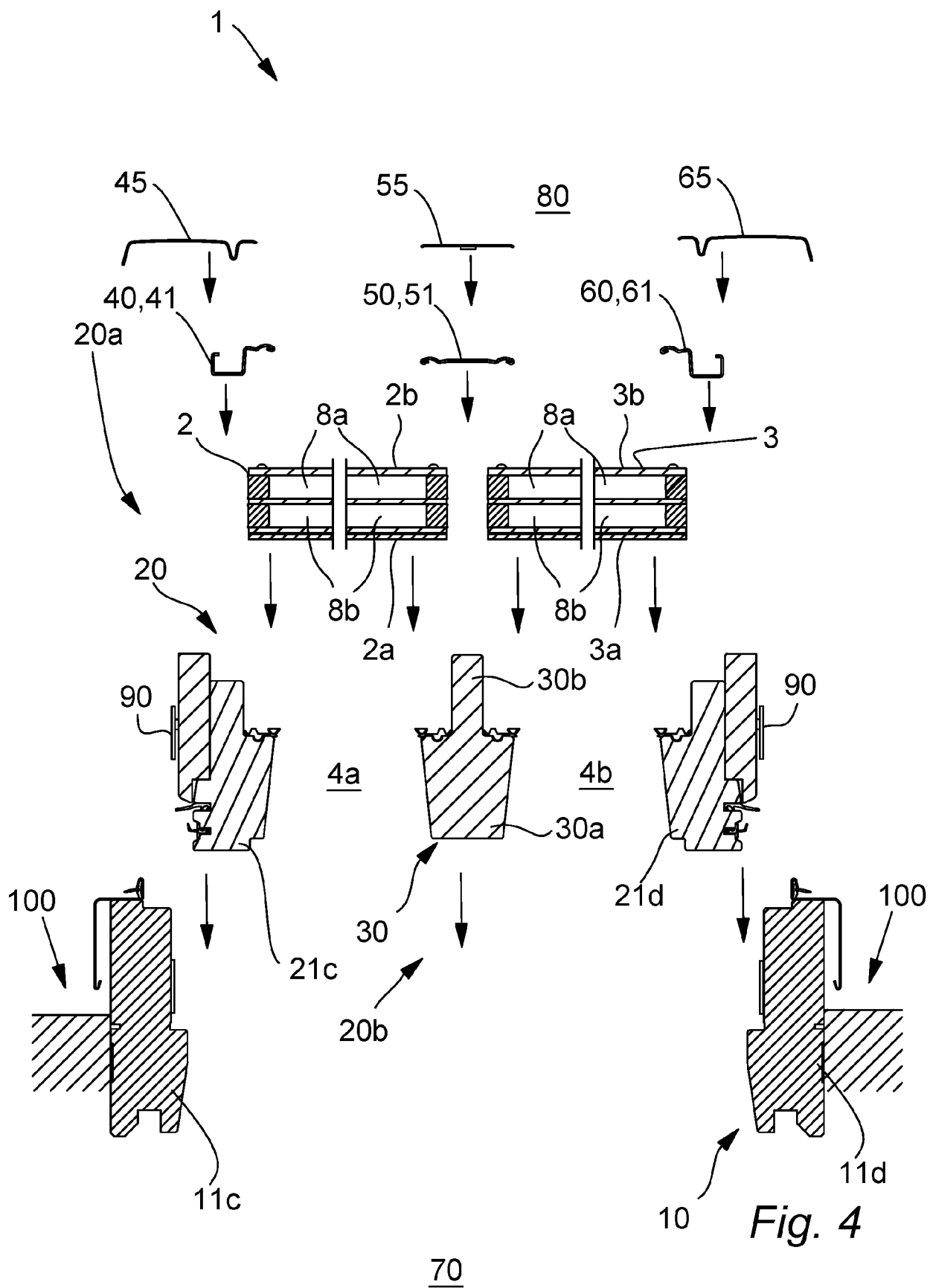


Fig. 2





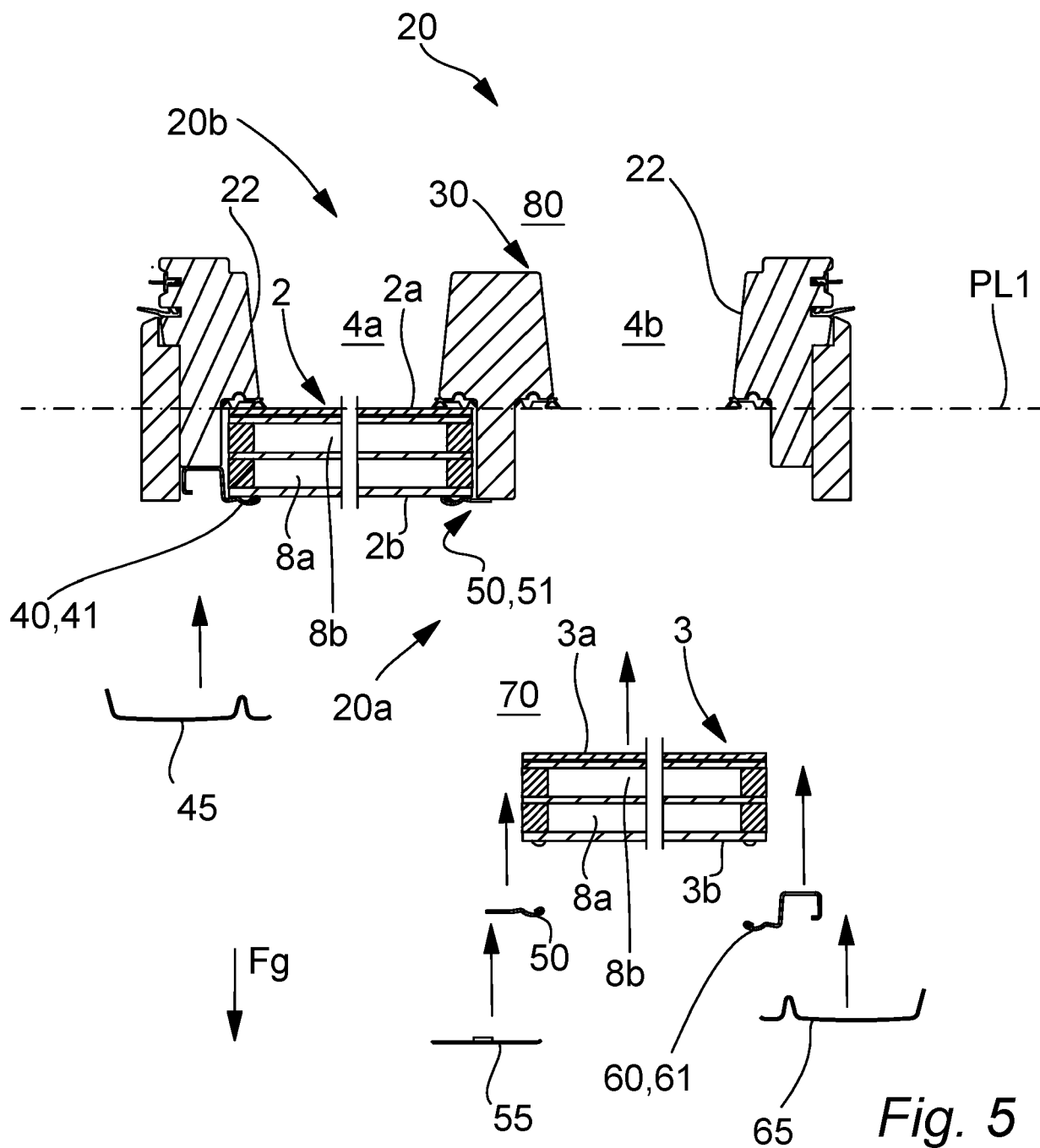


Fig. 5

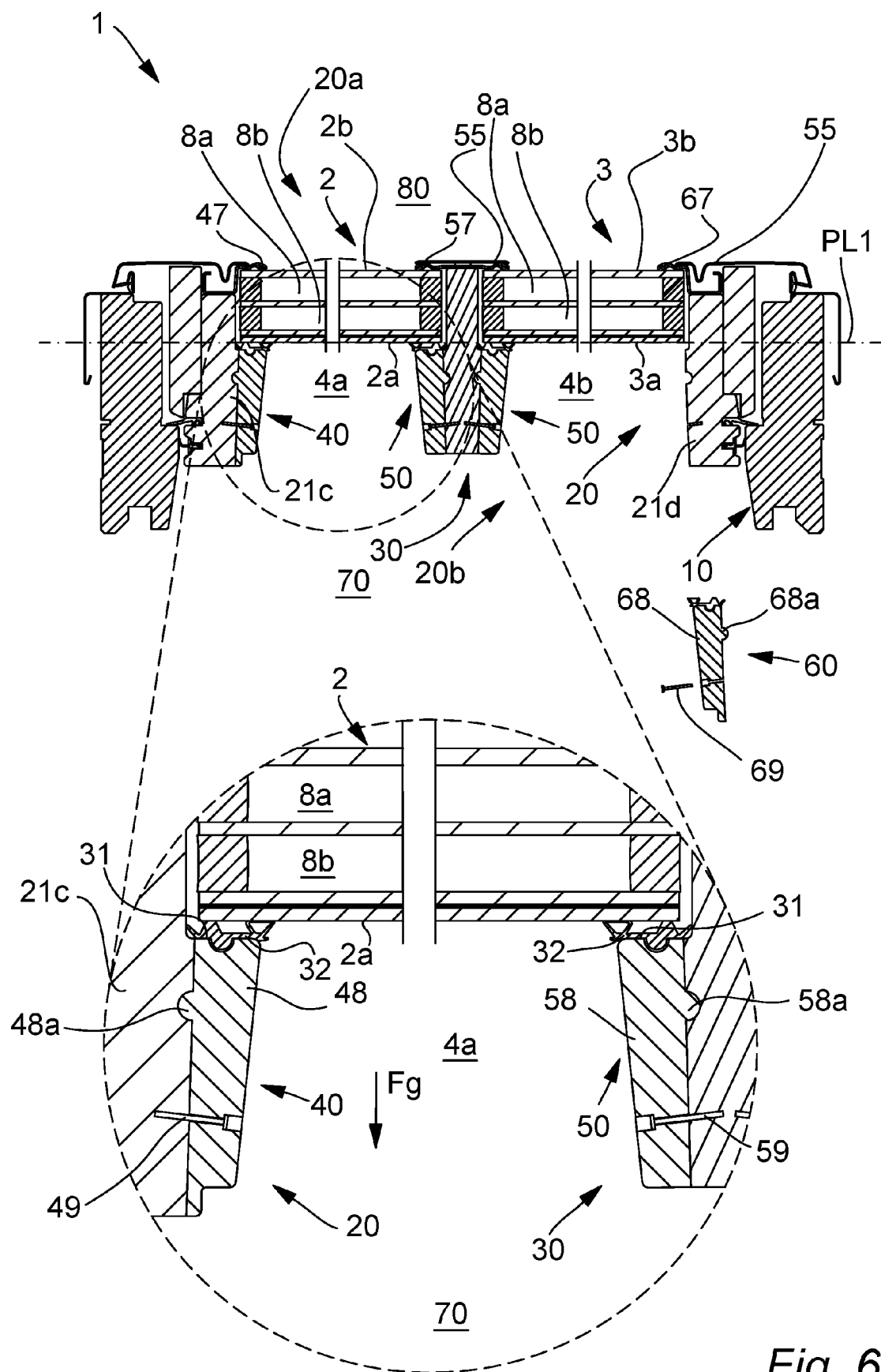


Fig. 6

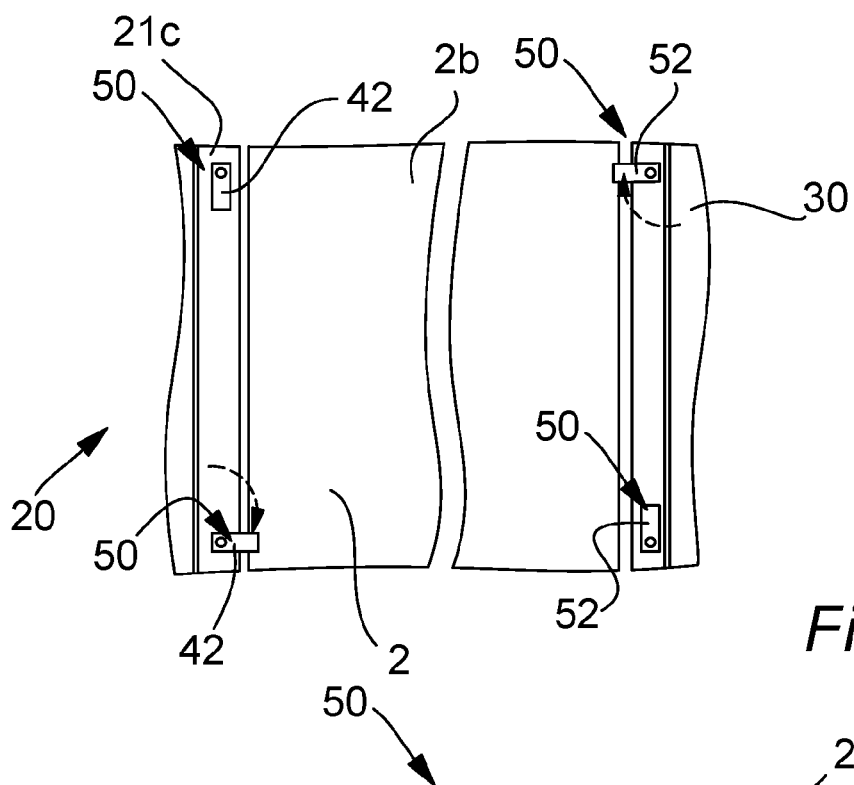


Fig. 7

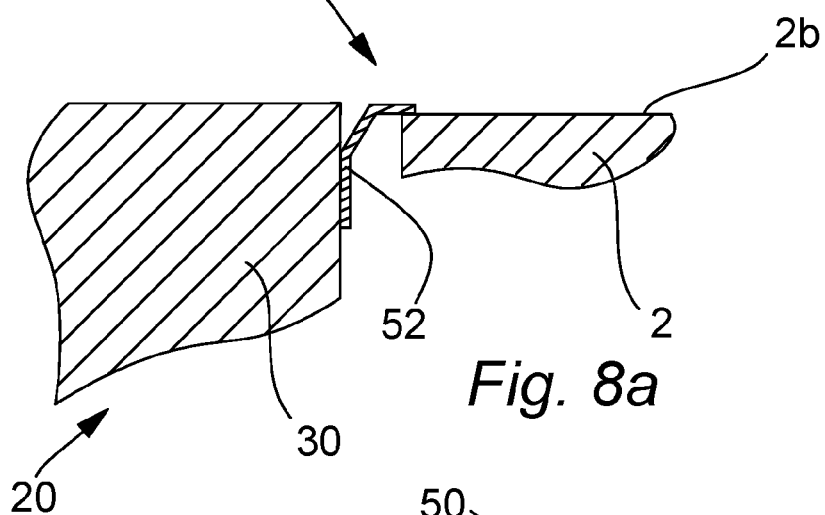


Fig. 8a

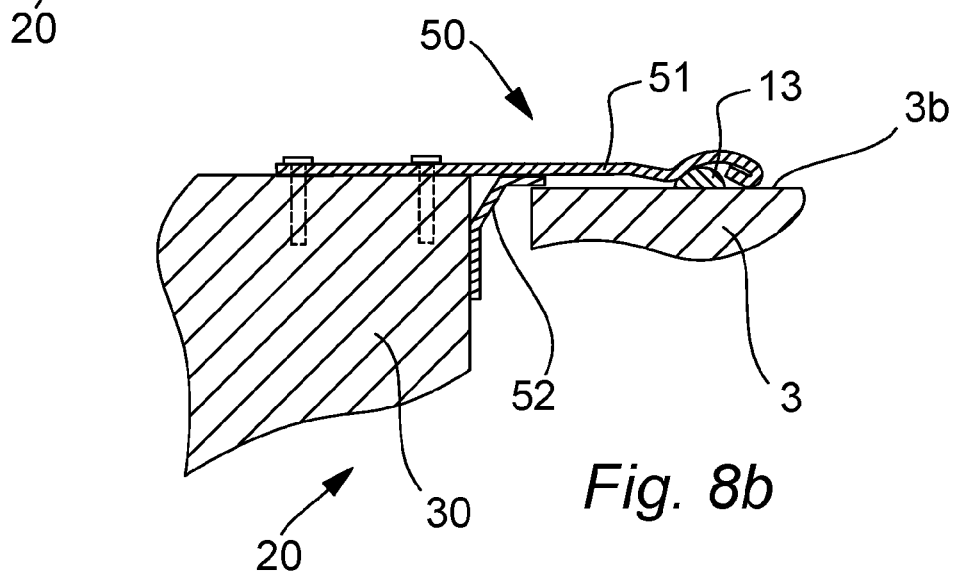


Fig. 8b

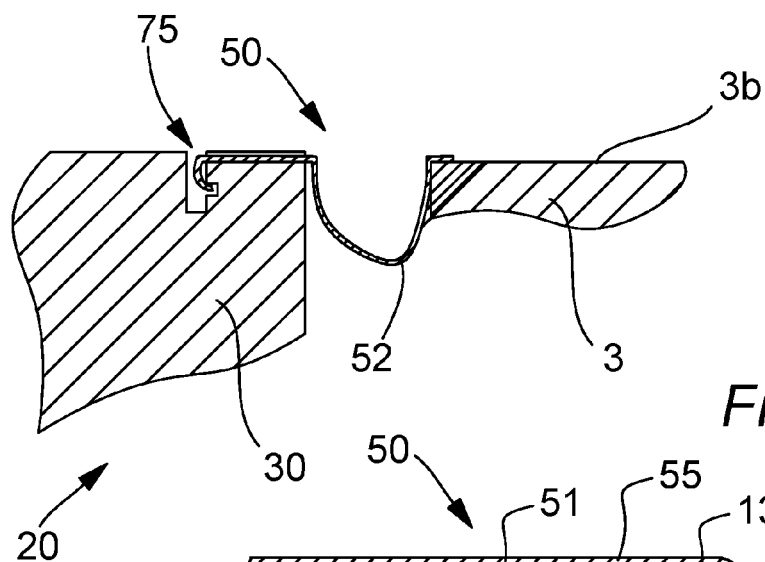


Fig. 9a

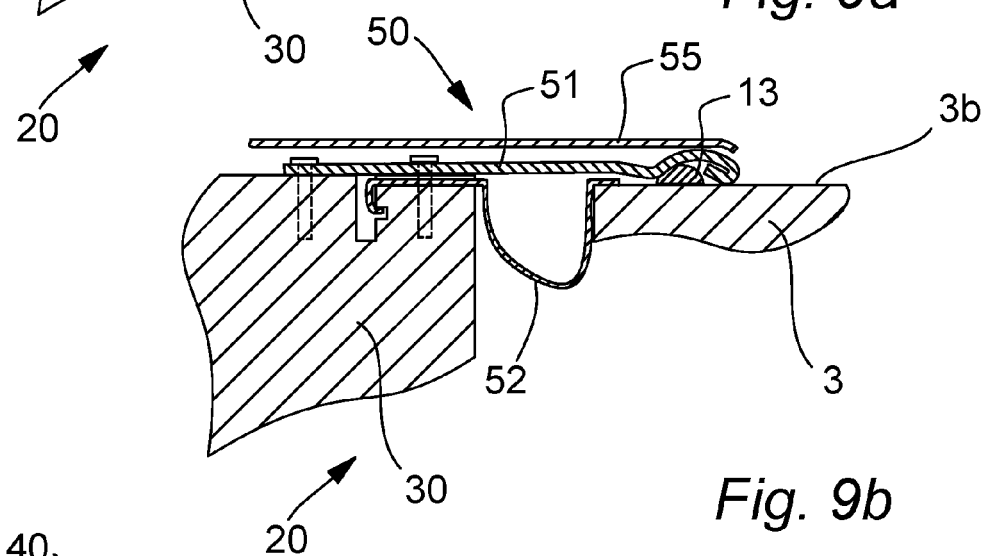


Fig. 9b

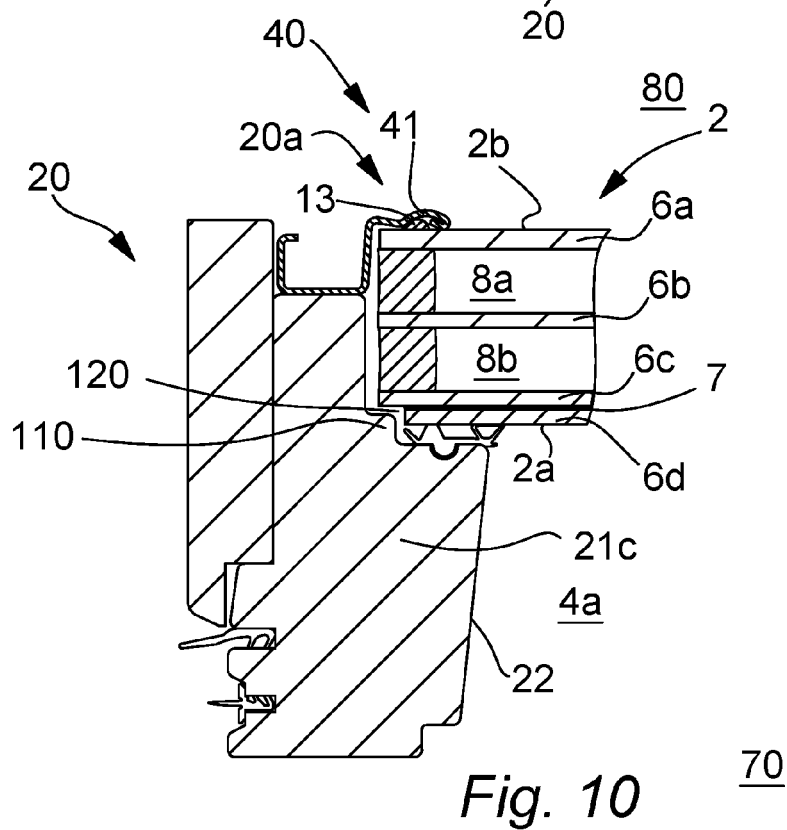


Fig. 10

70

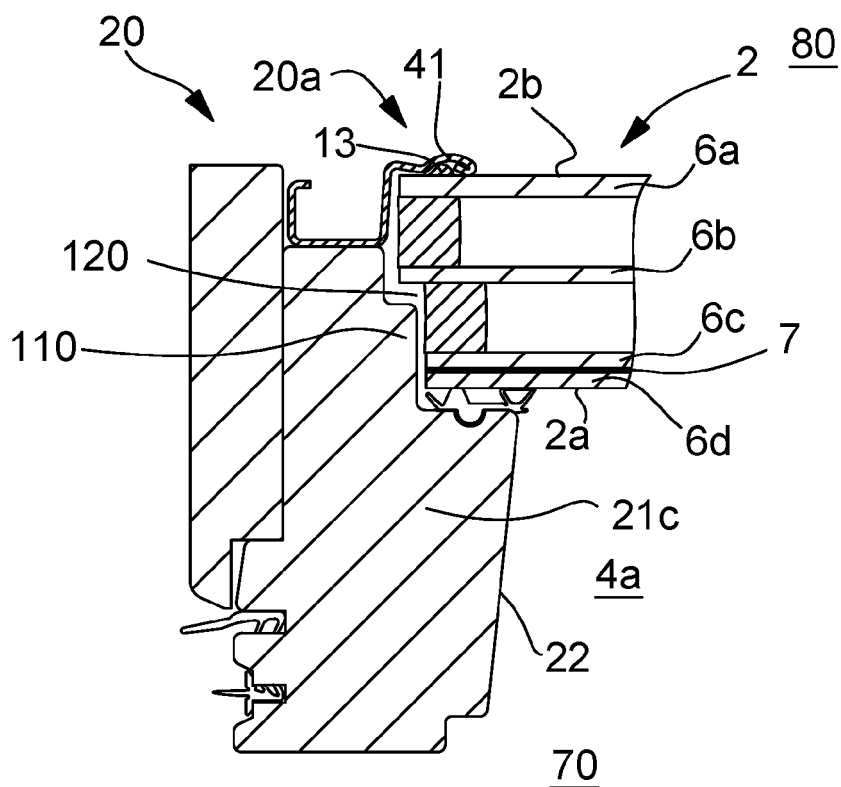


Fig. 11

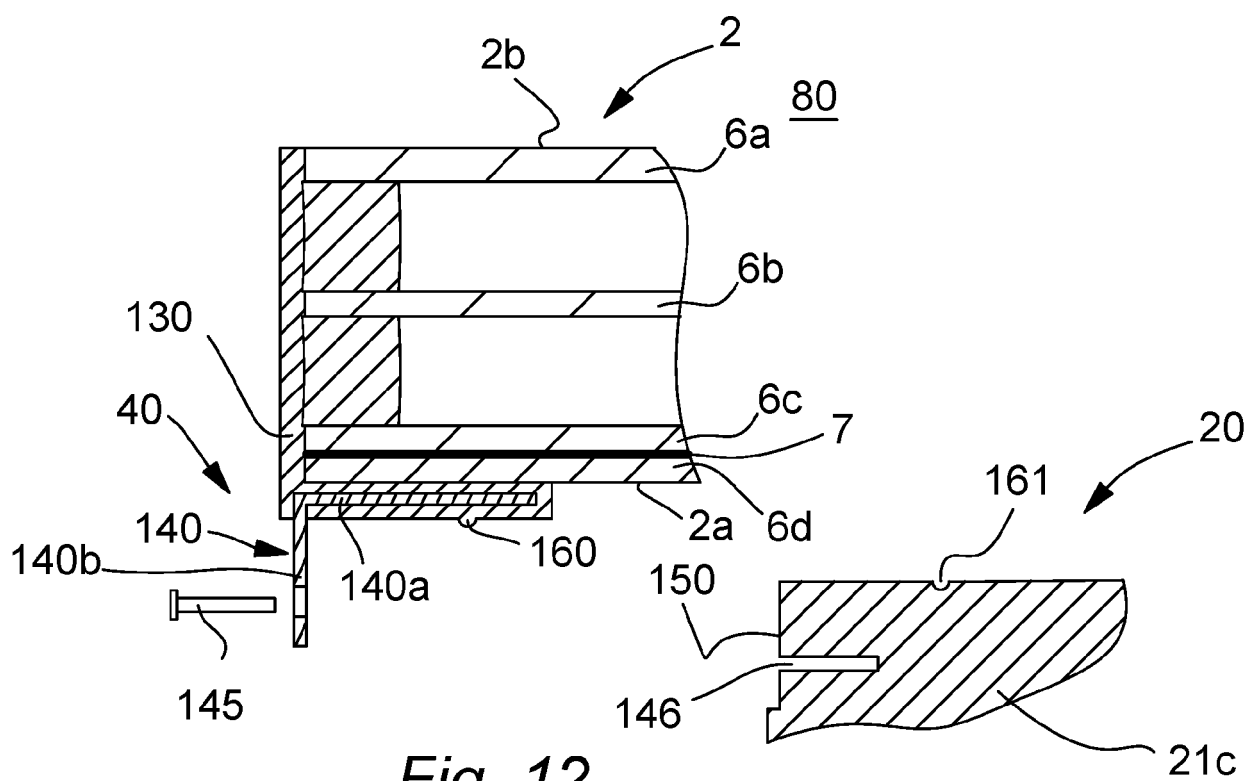
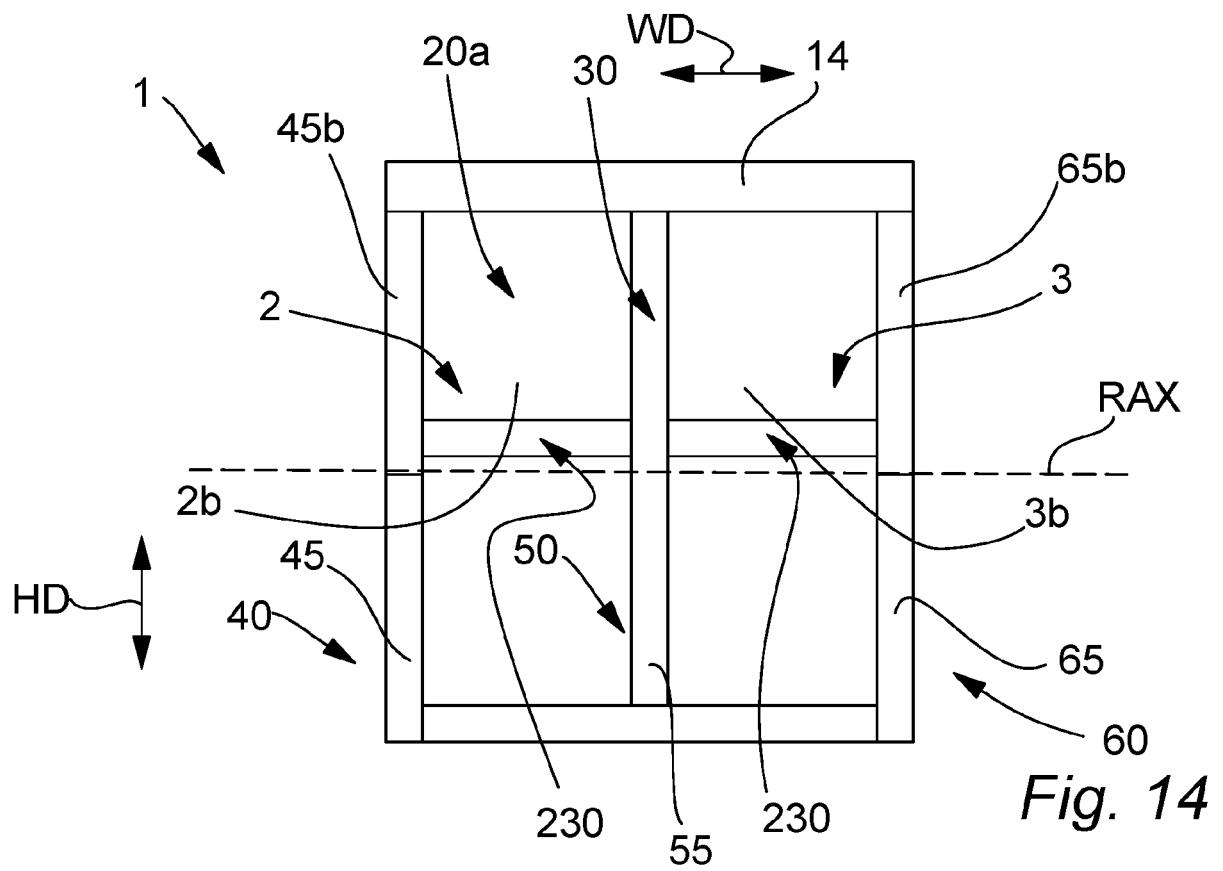
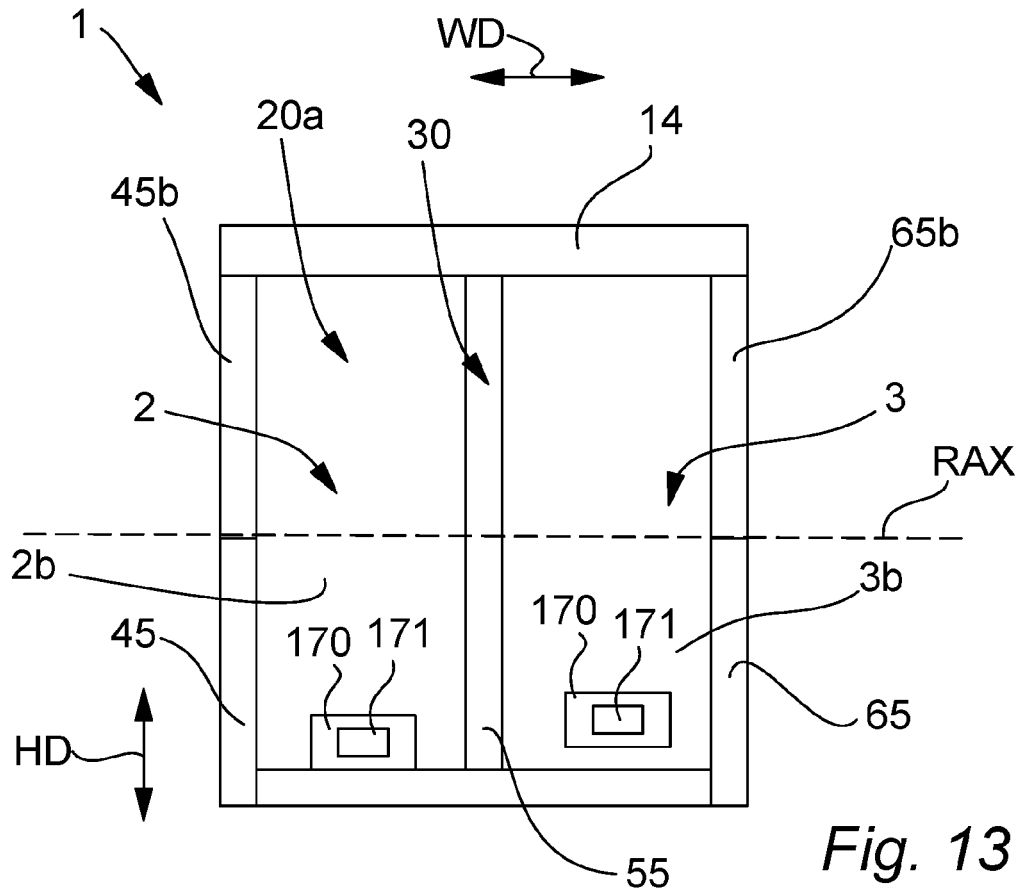


Fig. 12



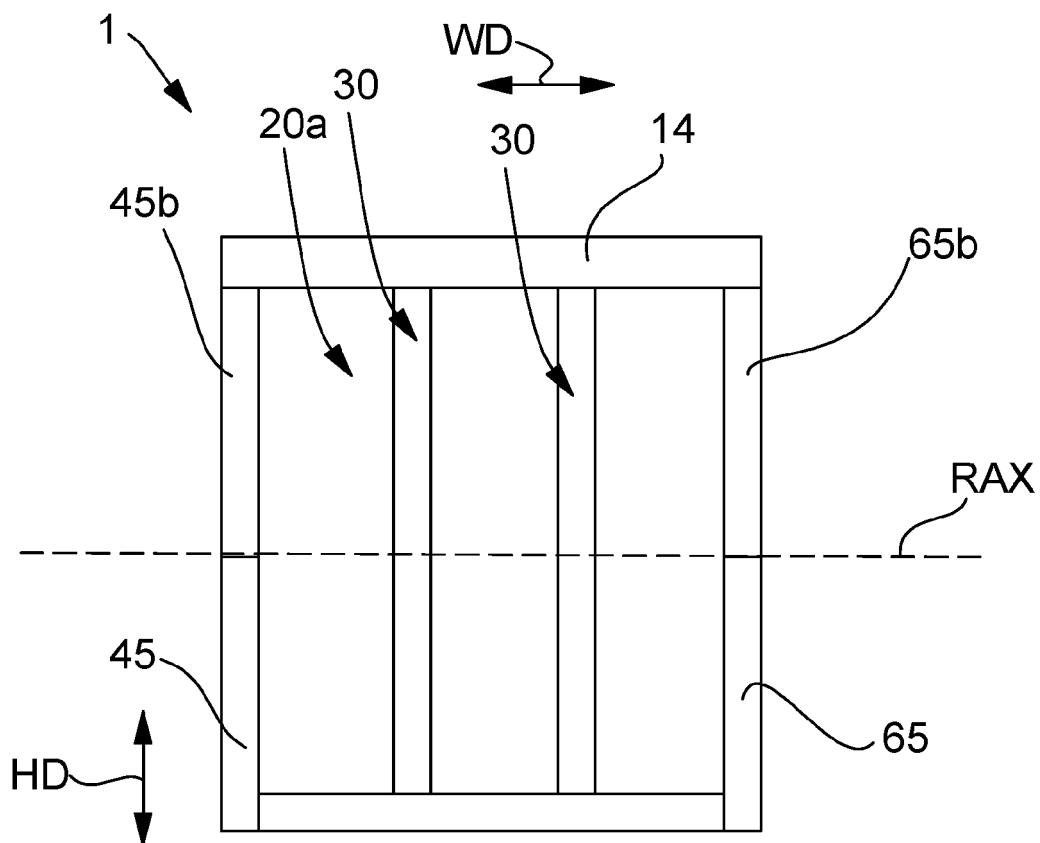


Fig. 15a

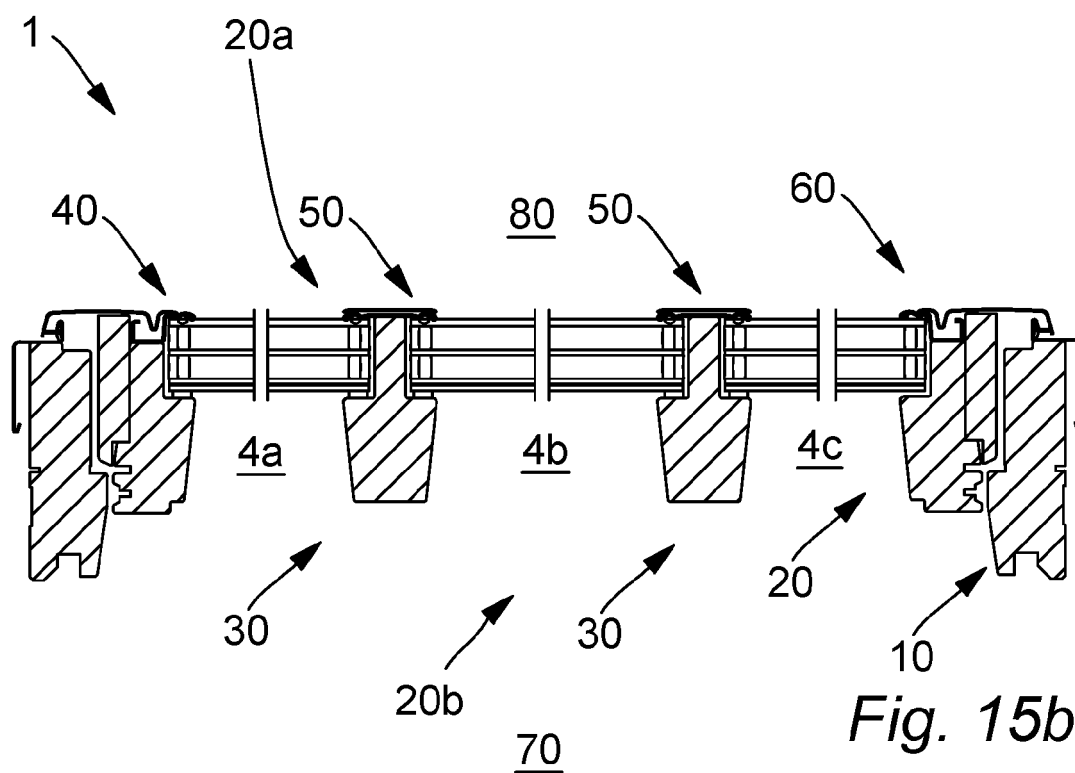


Fig. 15b

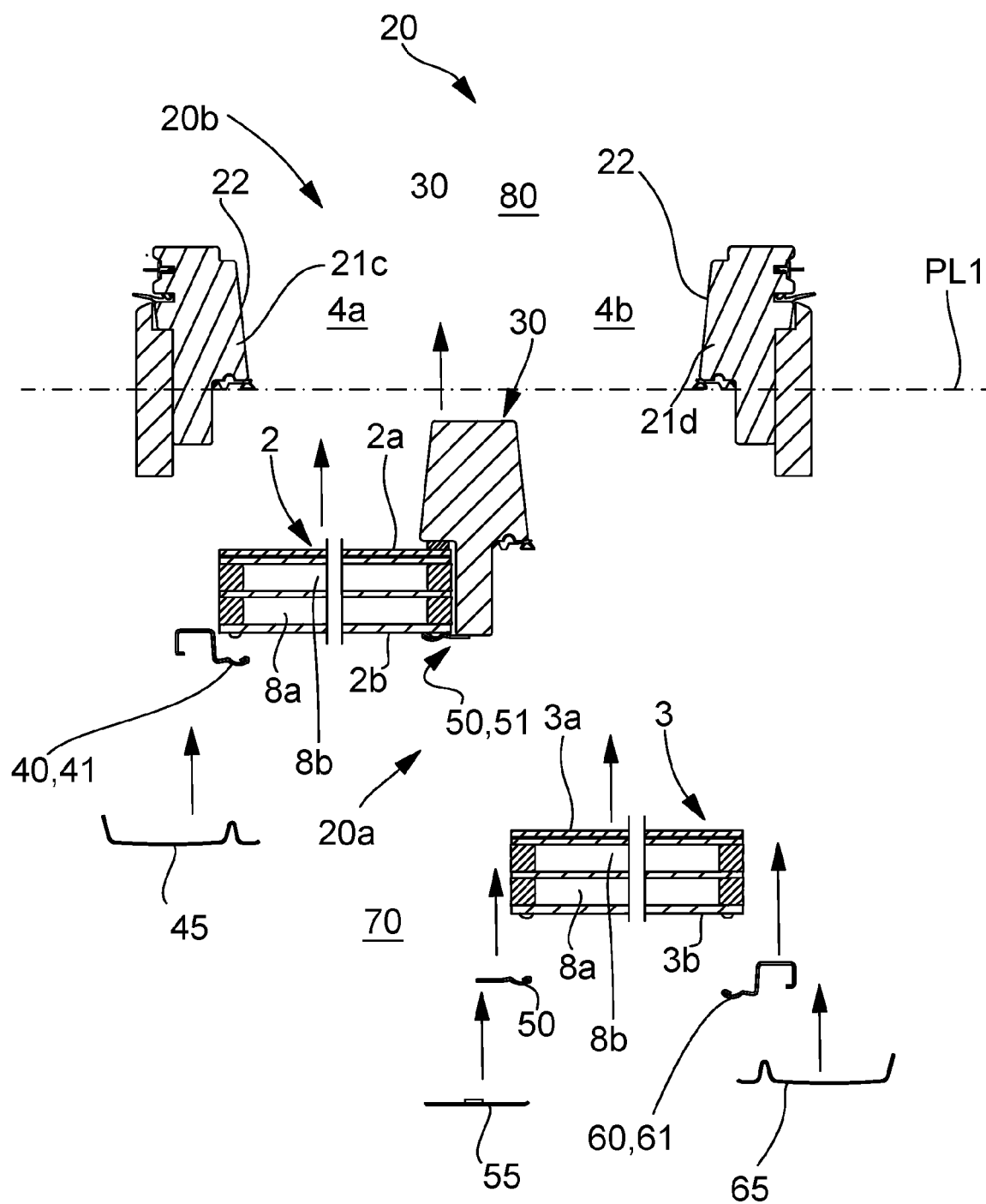


Fig. 16

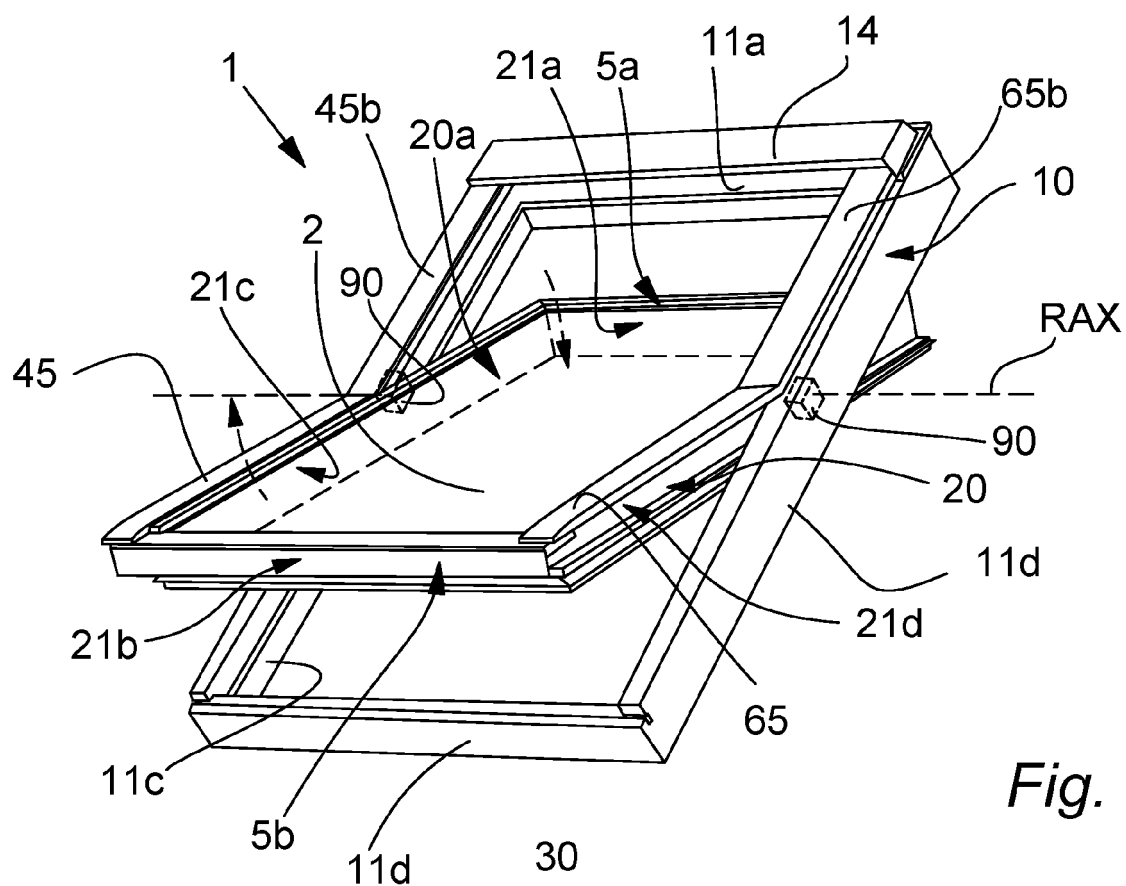


Fig. 17

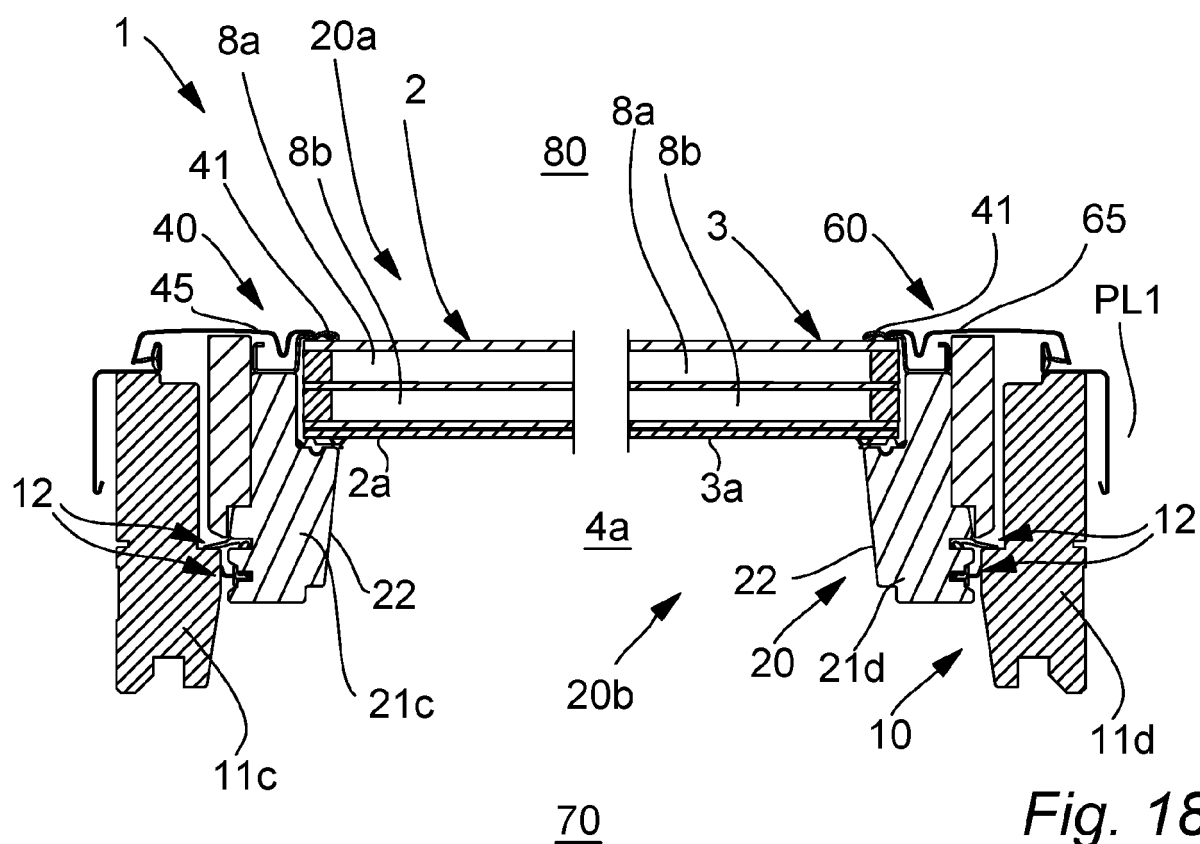
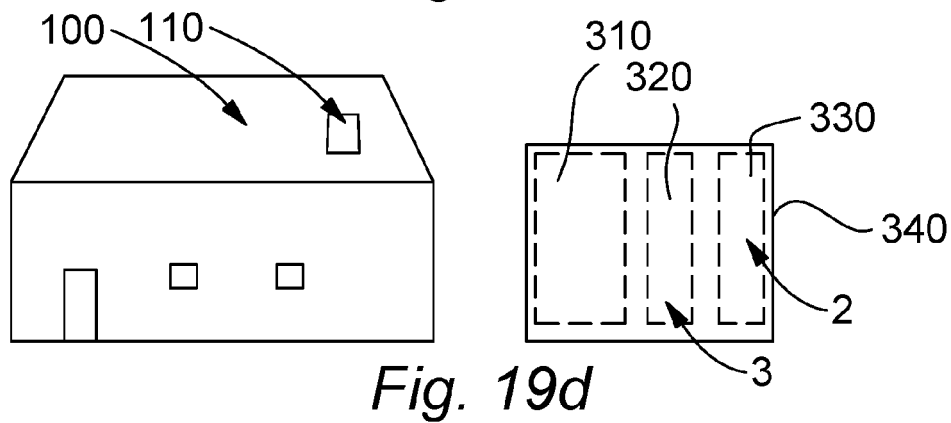
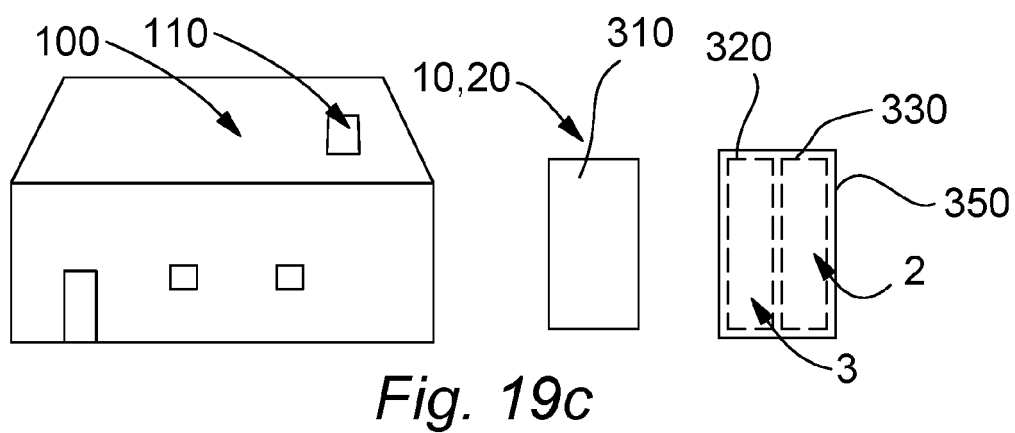
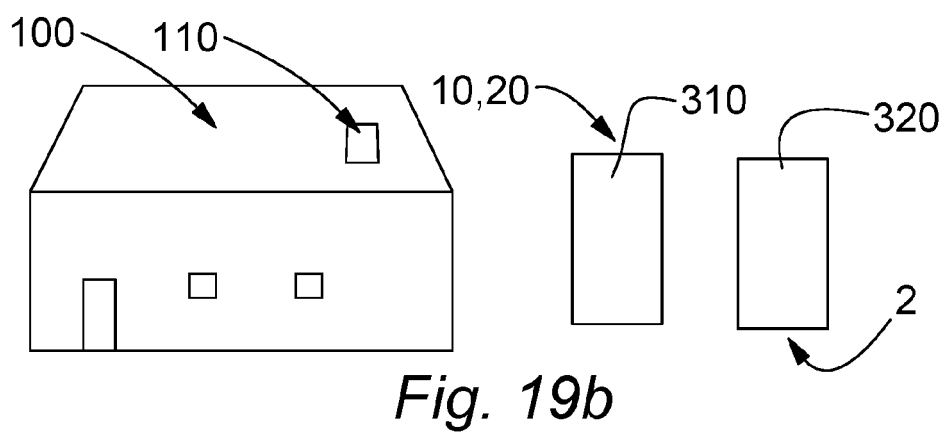
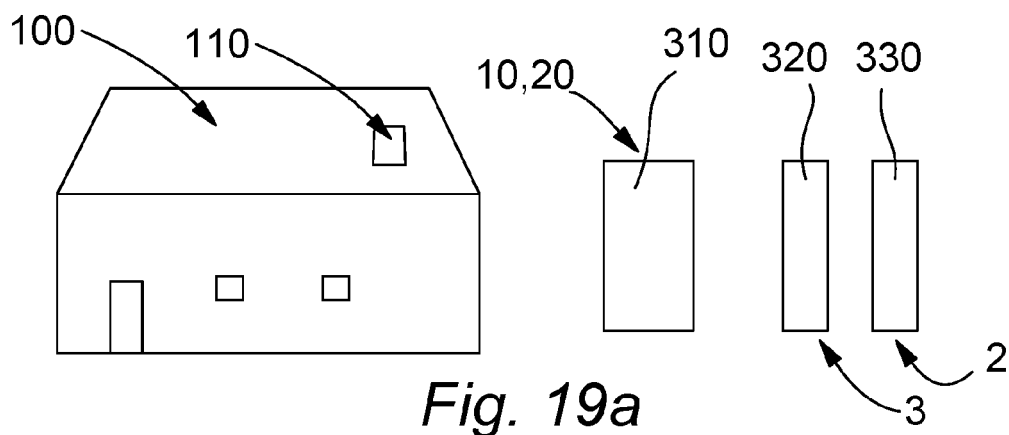


Fig. 18





EUROPEAN SEARCH REPORT

Application Number

EP 21 19 3907

5

10

15

20

25

30

35

40

45

50

55

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 869 439 A1 (VKR HOLDING AS [DK]) 25 August 2021 (2021-08-25) * paragraph [0095]; figure 5 * -----	8	INV. E04D13/03 E04D13/035
X	Velux Group: "Handboek voor de installatie van VELUX dakvensters", , 1 January 2014 (2014-01-01), pages 1-89, XP055500363, Retrieved from the Internet: URL:https://velcdn.azureedge.net/~media/m arketing/uk/brochures/installer_handbook.p df [retrieved on 2018-08-16] * pages 10,11 - pages 53,54 * -----	1	
A,D	EP 3 348 513 A1 (VKR HOLDING AS [DK]) 18 July 2018 (2018-07-18) * figures 11a-11b * -----	1-17	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04D
1	The present search report has been drawn up for all claims		
Place of search The Hague		Date of completion of the search 21 January 2022	Examiner Leroux, Corentine
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 19 3907

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-01-2022

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3869439 A1	25-08-2021	EP 3869438 A1	25-08-2021
		EP 3869439 A1	25-08-2021
		EP 3869440 A1	25-08-2021
EP 3348513 A1	18-07-2018	DE 202018006631 U1	10-12-2021
		DK 201770028 A1	27-07-2018
		EP 3348513 A1	18-07-2018

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 3348513 A1 **[0004]**
- EP 3192943 A1 **[0005]**
- EP 3252255 B1 **[0086]**
- EP 1038083 B1 **[0086]**
- EP 2188462 B1 **[0185]**